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ABSTRACT

This guide is designed to provide assistance and support to school districts for the development of a comprehensive K-12 environmental education program. Emphasis is placed on the acquisition of knowledge, attitudes, and skills that would lead to responsible stewardship of the environment. Infusion of environmental topics into all curricular areas is recommended. Major sections include: (1) an introduction to environmental education curriculum development (presenting a rationale and goals); (2) fundamental principles of environmental education content (identifying basic elements of environmental literacy); (3) value development (discussing stages and strategies in value education); (4) teaching and learning approaches (addressing both cognitive and affective domains); (5) the infusion process (explaining step-wise procedures for infusing environmental topics into the existing curriculum); (6) program development (with evaluation considerations); and (7) current issues (discussing controversial topics, computers, and equity factors). Appendices include the Tbilisi Declaration, a list of available resources, three sample infused units, and a list of perceived major threats to environmental quality. (ML)

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Environmental Education

SE 046 297

Wisconsin Department of Public Instruction
Herbert J. Grover, State Superintendent

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A Guide to Curriculum Planning
in
Environmental Education

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Foreword

A Guide to Curriculum Planning in Environmental Education has been developed to provide assistance and support to school districts in the development of a comprehensive K-12 environmental education program. It is not a mandated course of study but is designed to help identify content and instructional approaches appropriate for local district programs.

This publication reflects the current thinking and experience of outstanding educators. It is rooted in a philosophy that the quality of life and the quality of the environment are directly related and that each citizen is responsible for maintaining environmental quality.

In order to establish a legacy which we will be proud to pass along to future generations, it is necessary for educators to help students develop an awareness and sensitivity to their environment—to help them understand how the environment functions, how people interact with it, and how environmental issues and problems arise and can be resolved.

Stewardship of our environment requires knowledge, attitudes and skills which are based on a commitment to shaping the world in which we live through thoughtful and active participation. It calls for a perspective which acknowledges that each of our actions has an effect on the entire global ecosystem. Teachers in all grades and subject areas have a role to play in helping students to realize it is a collective responsibility to preserve and cherish our home, this precious planet Earth.

I am confident that Wisconsin educators will rise to accept this challenge and that together we will see a higher quality environment and, indeed, a higher quality of life for present and future generations everywhere.

Herbert J. Grover
State Superintendent

Preface

Wisconsin's historical commitment to education about the environment is well known. As the environmental movement emerged in the late 1960s, this commitment grew even stronger. Coupled with a growing national and international recognition of the need for environmental education program development, Wisconsin's efforts began to exhibit a less parochial and more global characteristic.

The following timeline highlights the major environmental education events in Wisconsin, the United States, and the world which led to the development of *A Guide to Curriculum Planning in Environmental Education*.

September 1967	The Wisconsin Department of Public Instruction appoints its first environmental education supervisor.
February 1970	Governor Warren Knowles sponsors a Conference on Environmental Education.
September 1970	Congress passes PL 91-516, The Environmental Education Act.
May 1971	Governor Patrick J. Lucey issues an executive order creating the Wisconsin Environmental Education Council.
June 1971	The Wisconsin Environmental Education Council holds its first meeting and elects State Superintendent William Kahl its chairperson.
August 1972	The United Nations Conference on the Human Environment, meeting in Stockholm, Sweden, recommends in its *Stockholm Declaration and Action Plan* that every nation promote environmental education program development.
August 1972	A leadership workshop on environmental education, sponsored by the Wisconsin Department of Public Instruction, the University of Wisconsin-Superior, and the National Science Foundation, prepares 23 educators to teach localized environmental education inservice courses for teachers and other educators. Over 50 such courses are subsequently taught.
May 1973	The Alliance for Environmental Education is formed to coordinate and promote national-level cooperation among organizations and agencies in their environmental education efforts.
December 1974	*Environmental Education in Wisconsin*, a Wisconsin master plan for environmental education developed by the Wisconsin Environmental Education Council, identifies six priority areas for environmental education, and suggests activities for eleven different sectors of the population to carry out in implementing the plan.
July 1975	The National Snowmass Conference: Environmental Education Perspectives and Prospectives produces two reports: *Environmental Education: Perspectives and Prospectives: Key Findings and Major*

	Recommendations; and *Environmental Education: Perspectives and Prospectives: Supporting Documentation* (Schaefer and Disinger, 1975). These reports recommend roles and responsibilities for elementary, secondary, and higher education; state governments; the federal government; industry, labor, and business; and organizations.
October 1975	UNESCO organizes an international workshop on environmental education in Belgrade, Yugoslavia, which produces a statement of need, goals, objectives, and guiding principles for developing environmental education programs, *The Belgrade Charter*. It is accompanied by a long list of recommendations.
September - November 1976	Six regional workshops are held around the world to react to *The Belgrade Charter* and its recommendations. One such workshop, the North American Seminar on Environmental Education, is held in St. Louis, Mo.
October 1977	The World's First Intergovernmental Conference on Environmental Education is organized by UNESCO and is held in Tbilisi, Georgia, USSR. It produces a refined statement of need, goals, objective categories, and guiding principles for environmental education program development, *The Tbilisi Declaration* (see Appendix A). An extensive set of recommendations accompanies the declaration. One recommendation urges each nation to hold its own national leadership conference on environmental education.
March 1978	A National Leadership Conference on Environmental Education is conducted in Washington, D.C. The report of this conference, *From Ought to Action in Environmental Education* (Stapp, 1978), includes sixteen recommendations targeted to groups at national, state, and local levels. One recommendation of the report for states urges that the goals and objectives of environmental education be further clarified for use by educators, and that mechanisms for achieving these goals be identified to encourage educators to utilize the *total* environment in *all* curriculum areas in program development and implementation.
May 1982	The World Community of States assembles in Nairobi, Kenya, under the sponsorship of the United Nations Environment Programme, and reaffirms its commitment to the *Stockholm Declaration and Action Plan*. It issues the *Nairobi Declaration*, a call for increased concern and activity to address problems of the global environment.
August 1983	The First National Congress for Environmental Education Futures: Policies and Practices brings together more than 30 environmental educational organizations to assess the effect and degree of implementation of the recommendations of the 1978 National Leadership Conference on Environmental Education. It produces a report containing a new set of recommendations for action and proposes similar meetings at no less than five year intervals (Gustafson, 1983).

September 1983	Superintendent of Public Instruction Herbert J. Grover appoints an Environmental Education Curriculum Development Task Force to develop *A Guide to Curriculum Planning in Environmental Education.*
October 1983	State Superintendent Herbert J. Grover promulgates a new administrative rule identifying competencies which must be demonstrated by those seeking licenses to teach science, social studies, agriculture, and elementary and early childhood education after July 1, 1985 (see Appendix B).
October 1983	The Environmental Education Curriculum Task Force begins work on *A Guide to Curriculum Planning in Environmental Education.*

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Gustafson, John A., et al, ed. *The First National Congress for Environmental Education Futures: Policies and Practices.* Columbus, OH: SMEAC Information Reference Center, 1983.

Schafer, Rudolph J. H. and John F. Disinger, ed. *Environmental Education: Perspectives and Prospectives: Key Findings and Major Recommendations.* Columbus, OH: SMEAC Information Reference Center, 1975.

————. *Environmental Education: Perspectives and Prospectives: Supporting Documentation.* Columbus, OH: SMEAC Information Reference Center, 1975.

Stapp, William B., ed. *From Ought to Action in Environmental Education: A Report of the National Leadership Conference on Environmental Education.* Columbus, OH: SMEAC Information Reference Center, 1978.

Acknowledgments

This publication is the fruit of the labor of many people, but one group in particular, the members of the Environmental Education Curriculum Development Task Force appointed by State Superintendent Herbert J. Grover in September 1983. The members of the task force are:

Elaine Andrews, Adult Continuing Education Programs Coordinator, Environmental Resource Center, University of Wisconsin-Extension, Madison
Roger Bauer, District Administrator, Woodruff
James Fortier, Teacher, Fairfield Center Elementary School, Baraboo
Frank Haeni, Science Teacher, Crivitz High School, Crivitz
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Martha Kronholm, Teacher, Mead Elementary School, Wisconsin Rapids
Helen Mallmann, Teacher, Grant Elementary School, Sheboygan
Hedda Newman, Science Teacher, McKinley Junior High School, Kenosha
Dean Sauers, Environmental Education and Social Studies Teacher, Menasha Senior High School, Menasha

These people donated many hours of their own time determining content, reviewing drafts, and recommending changes. One member, Ronald Harshman, authored that part of the guide entitled "Value Development and Environmental Education." All task force members served on subcommittees responsible for drafting one or more of the environmental education curriculum development monographs, companion publications to this guide. The work of this group of people is deeply appreciated.

There is another group to whom special thanks are due. The original draft of this publication was completed by a committee created under the sponsorship of the Wisconsin Citizens' Environmental Council, the Wisconsin Association for Environmental Education, and the Wisconsin Department of Public Instruction. The members of this committee were: Robert Buchanan, Madison; Trudy Cayo, Milwaukee; David Engleson, Madison; Ronald Harshman, Superior; Pamela Heaney, Madison; Patrick Hermans, Pulaski; Walter Hitt, Marinette; Heather Holmberg, LaCrosse; Dean Sauers, Menasha; Al Stenstrup, Oconto; Caryl Terrell, Madison; Al Weiss, Milwaukee; Dennis Yockers, Poynette; Bill Zahn, Wauwatosa; and Carlton Zentner, Fort Atkinson. They, too, donated many hours of their time to this special cause, conceiving the idea for the guide and determining much of its eventual content. They made the work of the Environmental Education Curriculum Development Task Force considerably easier than it might have been otherwise.

The Wisconsin Citizens Environmental Council provided the funding needed to bring the above committee together for two weekend writing sessions. This generous act is also deeply appreciated.

Most of the fine photographs used in this guide are the work of George Howlett and others associated with Project I-C-E (Instruction-Curriculum-Environment), a nationally validated project directed by Robert Warpinski. Special thanks go to these people.

Finally, no project such as this would succeed unless a dedicated group of support staff made a special effort. Connie Haas, Jeanne Hook, and Eileen Kohls are to be commended for their excellent work.

All of these people made the task of preparing this guide possible. I hope they grew professionally and enjoyed it as much as I did.

David C. Engleson
Environmental Education Supervisor
Task Force Chairperson

How to Use this Guide

The title of this publication, *A Guide to Curriculum Planning in Environmental Education*, should lead educators to recognize that it is not a curriculum guide in the traditional educational sense. The environmental curriculum development monographs which accompany this guide are also not traditional curriculum guides. These publications are designed to be used as aids in planning and implementing a school district environmental education curriculum. *However, the production of a school district environmental education guide, a publication detailing the district's environmental education program, is not recommended.*

This guide and the accompanying curriculum monographs emphasize the *infusion* of environmental topics into all curricular areas. They were designed to be used by school district s*ubject area* committees as they develop new or modify existing curriculum guides. As the members of these committees complete their tasks, they should use this guide and the monographs to infuse environmental topics into the curriculum framework, scope and sequence, and activities that they develop.

Additional discussion of this procedure is provided in Section 5, "A Process for Infusing Environmental Topics into the Existing Curriculum," and Section 6, "Developing and Implementing a School District Environmental Education Program."

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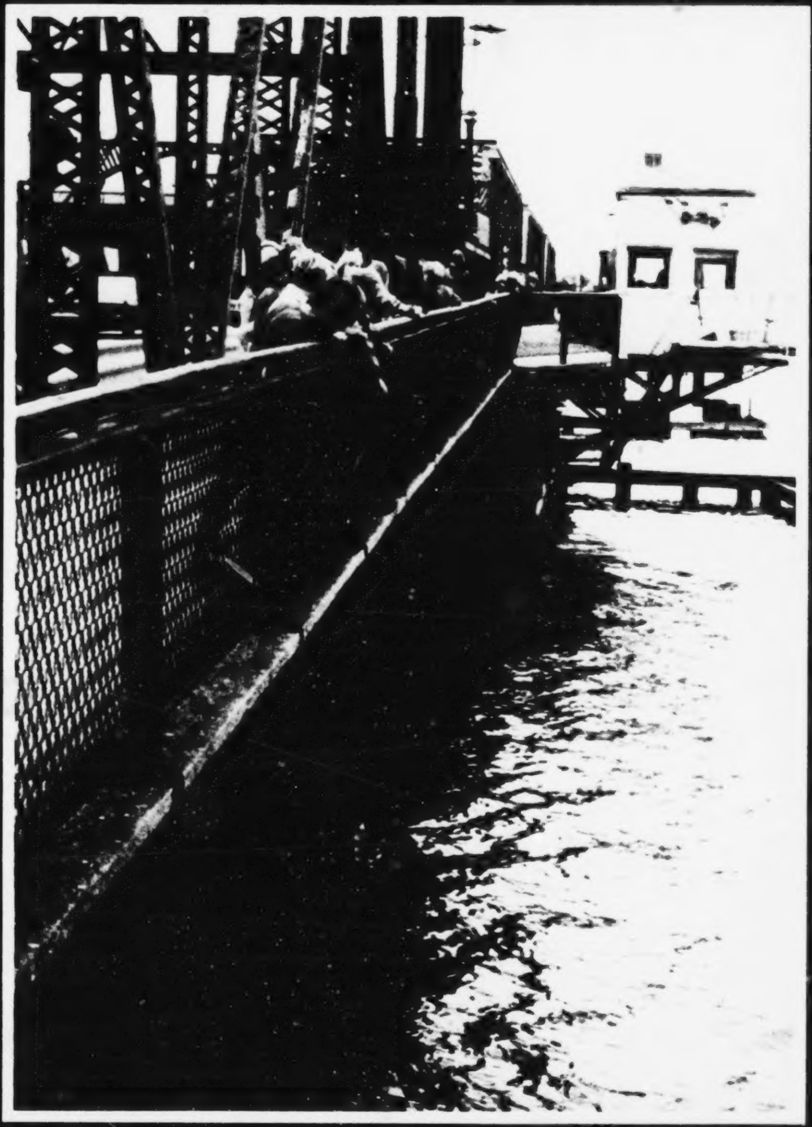


Rationale

Man has been on a spaceship all this time. It is a tiny little spaceship, only 8,000 miles in diameter. . . . And yet this tiny spaceship is so superbly designed that it provides everything man needs for his journey through space.
– R. Buckminster Fuller

Over the past several decades the human inhabitants of planet Earth have witnessed unprecedented technological progress which, while bringing benefits to many, has caused severe worldwide environmental consequences. This condition, although primarily caused by the actions of the inhabitants of a relatively small number of nations, affects all inhabitants of the planet. Rapid technological progress and its environmental effects have been accompanied by a similarly unprecedented economic growth, particularly within the same relatively small number of nations. One result of this economic growth has been severe social consequences; and although this document is not intended to deal with them, they must not be ignored. As technological progress and economic growth exist in a close relationship, so do their accompanying environmental and social consequences.

There would seem to be little need to justify an *urgency* for education about the environment, but for those who are not yet convinced, consider the two introductory paragraphs to the "Major Findings and Conclusions" section of *The Global 2000 Report to the President: Entering the Twenty-First Century*, prepared by the President's Council on Environmental Quality and the Department of State (Barney, 1980):

> If present trends continue, the world in 2000 will be more crowded, more polluted, less stable ecologically, and more vulnerable to disruption than the world we live in now. Serious stresses involving population, resources, and environment are clearly visible ahead. Despite greater material output, the world's people will be poorer in many ways than they are today.
>
> For hundreds of millions of the desperately poor, the outlook for food and other necessities of life will be no better. For many it will be worse. Barring revolutionary advances in technology, life for most people on earth will be more precarious in 2000 than it is now—unless the nations of the world act decisively to alter current trends.

Are such words an overreaction to conditions of the late 1970s during which they were written? Ask the people of Ethiopia, or of any other Third World nation, who at this time (1985) are struggling to gain the "necessities of life."

The Earth has been described as a spaceship with all of its inhabitants dependent upon each other for survival. If this is true, then every action of an individual must be performed with consideration of not only the immediate local but also the potential global consequences of that action. If actions are based on ethics, then there exists an urgent need for the development of a new *global ethic*, an ethic which espouses attitudes and behaviors for individuals and societies which are consonant with humanity's place within the biosphere, an ethic which recognizes and sensitively responds to both the complex and everchanging relationships between human beings and nature and among human beings.

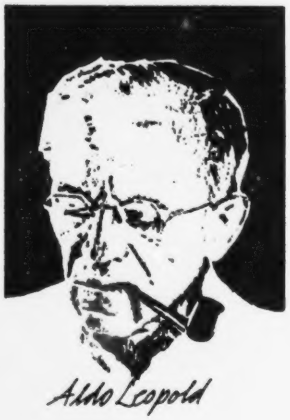
Such an ethic assumes that all persons present and future are entitled to equal respect and a share of the benefits of the environment, and that nature's processes and life support systems are entitled to the same careful respect when used for the achievement of a higher quality of life. Such an ethic is incompatible with value orientations which regard persons and natural resources as things to be exploited simply for the gratification of certain human beings at the expense of other human beings and living things.

Developing a *global ethic* will not be an easy task. Governments and policy makers can and may order changes, and new approaches to development can and may begin to improve the world's condition—but these are no more than short-term solutions unless the youth of the world are educated with such an ethic in mind. This kind of education has come to be called *environmental education*.

Almost 40 years ago the noted environmental philosopher Aldo Leopold called for the development of a "land ethic" very much like the global ethic discussed above.

> *What formal education has to do is to produce people who are fit to be inhabitants of the planet .... Otherwise [young people] are going to grow up and discover that we have taught them how to live in a world long gone.*
>
> *–Kenneth Boulding*

> That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics. That land yields a cultural harvest is a fact long known, but latterly often forgotten.
>
> All ethics so far evolved rest upon a single premise: That the individual is a member of a community of interdependent parts. His instincts prompt him to compete for his place in the community, but his ethics prompt him also to cooperate ....
>
> The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land.
>
> In short, a land ethic changes the role of *homo sapiens* from conqueror of the land community to plain member and citizen of it. It implies respect for his fellow members, and also respect for the community as such (Leopold, 1966).



Aldo Leopold

Leopold recognized that education has an important role to play in achieving such an ethic.

> The usual answer to this dilemma is 'more conservation education.' No one will debate this, but is it certain that only the *volume* of education needs stepping up? Is something lacking in the *content* as well? (Leopold, 1966)

The development of a new *global environmental ethic* depends at least in part upon educators' improving the content of environmental education programs at the elementary and secondary school level.

Philosophy

This publication reflects the current thinking and experience of educators from Wisconsin, the nation, and the world. Its underlying philosophy is an extension of that professed in the Tbilisi Declaration (see Appendix A) and the Report of the First National Congress on Environmental Education Futures: Policies and Practices (Gustafson, 1983).

The quality of the environment and the quality of life for the inhabitants of planet Earth are directly related. The human inhabitants of Earth have the power to control the quality of the environment. Too frequently the use of this power has a negative environmental impact, often to the point of irreversibility. Thus the defense and improvement of the environment on behalf of present and future generations of all living things has become an imperative goal for all human beings. Every citizen of planet Earth must accept responsibility for this goal and become an active participant in working toward its achievement.

Society prepares its citizens to carry out their responsibilities through its system of education. Education *must* work to help each citizen develop an awareness of and a sensitivity to the environment and its problems. Furthermore, education *must* help each citizen acquire the knowledge and understanding needed to perform effectively. And, education *must* foster positive attitudes and patterns of conduct toward the environment. This is the role of environmental education.

Environmental education must prepare individuals to be responsive to a rapidly changing technological world, to understand contemporary world problems, and to provide the skills needed to play a productive role, as all citizens must, in the improvement and protection of the environment. In doing so, environmental education must consider all aspects of the environment—natural and built, technological, social, economic, political, cultural, and aesthetic—and acknowledge their interdependence. And, environmental education must emphasize an enduring continuity linking actions of today to consequences for tomorrow and the need to think in global terms.

To accomplish the above, environmental education programs must be continuous, must pervade all subject areas at all grade levels, and must offer students experiences which are as concrete and direct as possible. Students must become involved in an active problem-solving process, investigating real environmental issues and problems in their own community and from a position of neutrality, with no position being advanced in favor over another (see Section 7 and Appendix C).

Environmental education must aid young citizens in developing a sense of responsibility and a commitment to the future, and must prepare them to carry out the role of defending and improving the environment on behalf of present and future generations of all living things.

Goal and Objectives

Goal

A goal statement describes in general terms a desirable condition to be achieved by certain actions. The need to develop a new kind of education designed to help students acquire a global environmental ethic has already been emphasized in this guide, and characteristics of this new kind of education have been described. The new education assumes that all teachers, regardless of grade level or subject area taught, have a measure of responsibility for helping students acquire this ethic. The following goal statement describes the desired end result of a K-12 environmental education program and is the basis for the balance of this guide.

> The goal of environmental education is to help students become environmentally knowledgeable, skilled, dedicated citizens who are willing to work, individually and collectively, toward achieving and maintaining a dynamic equilibrium between the quality of life and the quality of the environment.

Objectives

Because of the breadth and depth of environmental concepts and their dispersion throughout the curricula, categories of—rather than specific—environmental education objectives are outlined below.

> *There is a need for sympathy, for sensitivity, and for understanding in environmental education. But that need can best be met through a concerted effort to build a solid conceptual base.*
> *– Verne N. Rockcastle*

Awareness: Helping students acquire an awareness and sensitivity to the total environment and its problems; develop the ability to perceive and discriminate among stimuli; process, refine, and extend these perceptions; and use this new ability in a variety of contexts.

Knowledge: Helping students acquire a basic understanding of how the environment functions, how people interact with the environment, and how issues and problems dealing with the environment arise and how they can be resolved.

Attitudes: Helping students acquire a set of values and feelings of concern for the environment and the motivation and commitment to participate in environmental maintenance and improvement.

Skills: Helping students acquire the skills needed to identify, investigate, and contribute to the resolution of environmental issues and problems.

Participation: Helping students acquire experience in using their acquired knowledge and skills in taking thoughtful, positive action toward the resolution of environmental issues and problems.

Grade-Level Emphases

Environmental education programs should conform to known growth patterns of students. *The fulfillment of human growth needs of students should never be subordinated to the fulfillment of societal needs or the demands of disciplines.* Theoretically, concerns for student growth and development, the fulfillment of social responsibilities, and the achievement of disciplined knowledge should not be in conflict. But in practice they frequently are in conflict, and most commonly sacrificed is the concern for human growth.

Research regarding intellectual, moral, and ethical development provides a basis for the consideration of human growth and development in structuring environmental education programs. The contributions of Jean Piaget and Patricia Arlin in the area of intellectual development, and of Herman Epstein and Conrad Toepfer, Jr., in the area of brain growth periodization are especially useful in this regard. The results of the work of Piaget and Arlin are summarized in table 1.

The results of the work of Epstein and Toepfer can be summarized as follows.

- The brain grows in a stagewise fashion, with spurts occurring for most children between the ages of 3-10 months, 2-4 years, 6-8 years, 10-12 years, and 14-16+ years.
- Plateaus in brain growth occur between the ages of 10 months-2 years, 4-6 years, 8-10 years, and 12-14 years.
- The first four brain growth stages coincide with the onset of the classic Piagetian stages. The last brain growth stage coincides with the fifth Piagetian stage identifed by Arlin.
- During brain growth periods, new facts and information can be learned when attached to the learning of appropriate new and higher level thinking skills.
- During plateau periods, new facts and information can be learned by utilizing the skills initiated during previous brain growth periods, thus aiding in the maturation of these new skills before progressing to another new, higher skill level.
- In some children, brain growth periods are short relative to those of other children; therefore, plateau periods also vary in length.
- Growth periods and plateaus do not occur in all children at the same time; therefore, it is important to identify when they occur in individuals in order to plan responsive learning environments during these stages.

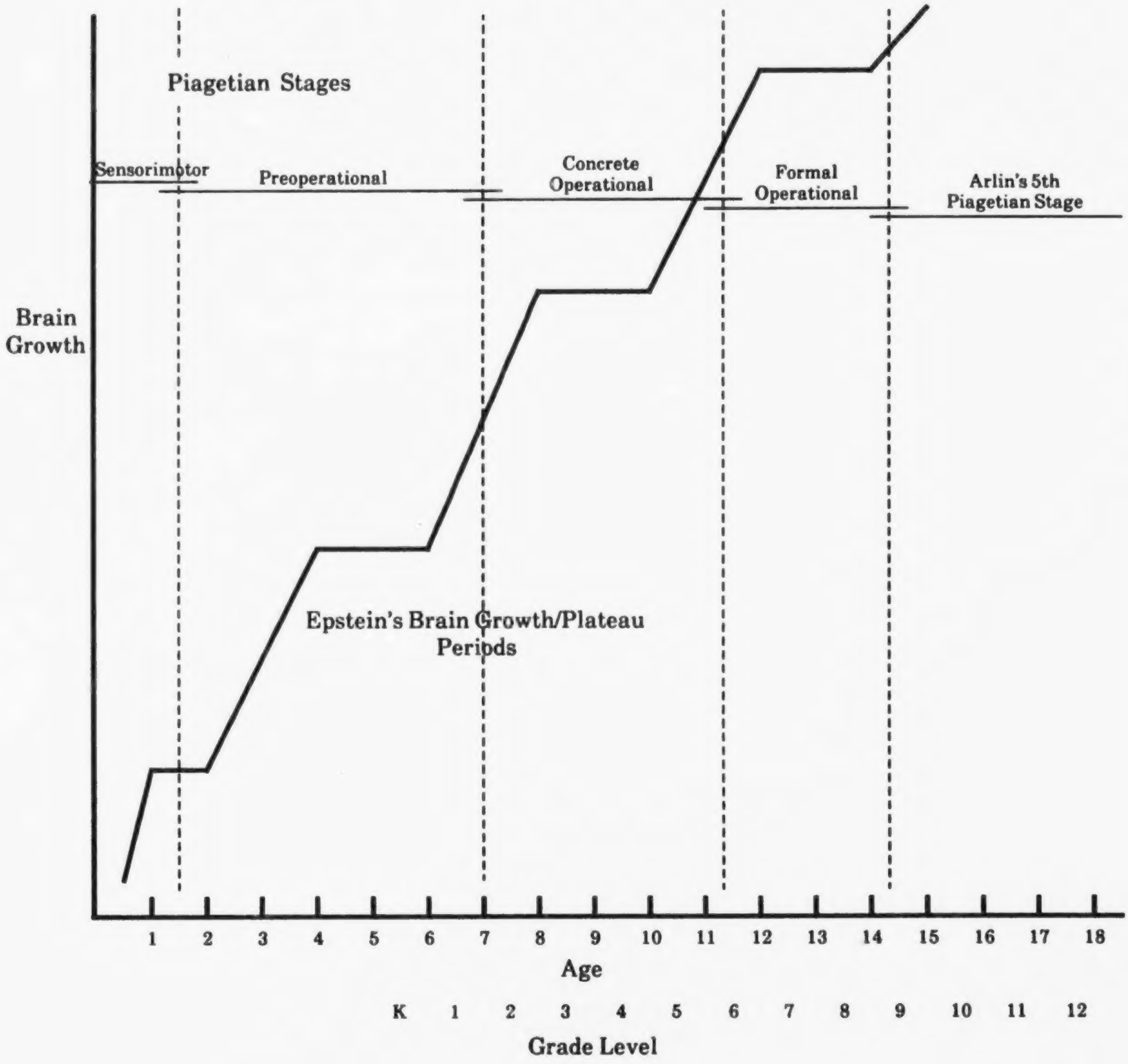
> *We can all continue to say we are only churchmen, or only educators, or only students, or only government people—that our role is limited, and that we cannot be expected to solve the problems of the world. But . . . some of us had better choose to define ourselves as world problem solvers if world problems are going to be solved.*
> *–Robert Theobald*

Table 1 ■

Piagetian Intellectual Development Stages

Developmental Stage	General Age Range	Characteristics of Children
Sensorimotor	Birth to approximately 18 months	— Preverbal — Objects exist only when in the perceptual field of the child — Hidden objects are located only through random physical search — Practical basic knowledge develops which forms a substructure for later representational knowledge
Preoperational	18 months to 7-8 years	— Organized language and symbolic function begins, thought and representation develop — Perceptually oriented, does not use logical thinking, cannot reason by implication — Directed by simple goals, activity includes crude trial and error corrections — Cannot coordinate variables, has difficulty in recognizing multiple properties of objects, often satisfied with multiple, sometimes contradictory explanations — Lacks operational reversibility in thought and action
Concrete Operations	7-8 years to 11-12 years	— Thinking becomes concrete but not abstract, however, elementary logical operations can be performed, and elementary groupings of classes and relations can be accomplished — Concepts of conservation develop in order of number, substance, length, area, weight, and volume — Concept of reversibilty develops — Cannot isolate variables, proceeds from step to step in thinking without realizing relationship beween them
Propositional or Formal Operational	11-12 years to 14-15 years	— Formal abstract thought ability begins to develop, marked by appearance of hypothetical—deductive reasoning based upon logic of all possible combinations, development of combinatorial system and unification of operations into a structured whole — Ability to perform controlled experimentation develops, keeping all but one factor constant — Ability to hypothesize variables before experimentation, to reverse direction between reality and possibility, develops — Can use interpropositional operations, combining propositions by conjunction, disjunction, negation, and implication
Arlin's Fifth Piagetian Stage	14-15 years and up	

Correlation between Piagetian Stages and Brain Growth Periods



The correlation between Piaget's stages and Epstein's and Toepfer's brain growth periods is portrayed in figure 1,which shows the relationship between the classical Piagetian stages and the brain growth spurts discovered by Epstein and Toepfer. An additional element of figure 1 is the relationship between the work of Piaget, Epstein and Toepfer and the usual grade level for individuals of a certain age.

These findings, if applied to the environmental education objective categories discussed in the previous section, suggest a changing degree of emphasis on each objective category for each of four grade level groups. table 2 summarizes these changing emphases.

■ Table 2

Grade-Level Emphases on Environmental Education Objective Categories

Level	Major Emphasis	Minor Emphasis
K - 3	Awareness Attitudes	Knowledge Skills Participation
3 - 6	Knowledge Attitudes	Awareness Skills Participation
6 - 9	Knowledge Skills Attitudes	Awareness Participation
9 - 12	Skills Participation Attitudes	Awareness Knowledge

> *I sincerely believe that for the child, and for the parent seeking to guide him, it is not half so important to know as to feel. If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow. The years of early childhood are the time to prepare the soil. Once the emotions have been aroused—a sense of the beautiful, the excitement of the new and unknown, a feeling of sympathy, pity, admiration or love—then we wish for the knowledge about the object of our emotional response . . . . It is more important to pave the way for the child to want to know than to put him on a diet of facts he is not ready to assimilate.*
> *- Rachel Carson*

Thus, an environmental education program should be developmental in nature. At the lowest grade levels, activities should concentrate on the development of *awareness* by helping children become skillful in the use of their senses in investigating the environment. This emphasis should gradually change until, in the middle to upper elementary grades, the skills learned are habitually applied to acquire *knowledge* and understanding about the environment.

An activity such as "Adopt A Tree" might involve kindergarten or first grade students in studying a tree in order to discover its characteristics—the color of its bark and leaves, the height above ground level where it first branches, differences in the texture of the bark on different parts of the trees, noises it makes, odors it emits, and the like. Although the students learn a great deal about trees in this activity, the real objective is to help them develop skill in the use of their senses. Later on, in grade 5 or 6, these same students might again study trees, but this time they study many kinds of trees, using earlier developed skills to discover similarities and differences so that names can be applied to them. They might also be led to discover where different kinds of trees grow—some in deep, shaded woods, others only in open, sunny areas.

The emphasis on *knowledge* acquisition continues in grades 6 through 9, and there is a new emphasis on the development of *skills*. A unit of study for this level might deal with hazardous chemical wastes problems. Part of this activity might consist of students would role playing different participants in various situations, for example, the waste producer or distributor, hazardous waste law enforcement agency staff, affected citizens, and community leaders. By so doing, students might come to understand how hazardous wastes become a problem, what laws govern their manufacture and use, whom to go to for help, how problems might be investigated, what constitutes evidence of responsibility, or, in other words, how the system works. This activity could also have students examine their own community. They might go to businesses and industries with a questionnaire, which they have developed, to find out what chemicals are being used, what wastes are being produced, and how those wastes are disposed of by the producer. An important skill to be developed as part of this activity is how to word non-threatening questions.

At the senior high school level, students should continue to develop *skills* useful in the investigation and resolution of environmental issues. They should also become active *participants* in the resolution of issues. Suppose that a rising groundwater table began to affect a community, causing basements to flood, and sewers and water mains to "float." Suppose that reports suggest that the water table rise is related to a rise in the bottom of a nearby stream due to increased sedimentation over a long time period. Students might become involved with the agencies and organizations—the Corps of Engineers, the Department of Natural Resources, and fish and wildlife clubs—which are concerned about the problem. Students might do historical research on the area, seeking out photographs depicting such early land use practices in the watershed as contour strip cropping or forested hillsides. Student photographers could then locate the same sites to photograph current land use practices which might affect the situation, for example, plowing up and down slopes or timber cutting. Students could attend meetings and hearings dealing with the problem, and if their research results in evidence impacting on it, they might even testify at these events.

These very brief examples demonstrate the developmental nature of environmental education programs. (See Appendix E for materials which discuss the five objective categories and suggest activities which help in their achievement.)

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2

Introduction

There are fundamental environmental principles which provide a content dimension for a K-12 environmental education program. Presented in the outline form which follows, they provide an organized view of what an environmentally literate citizen should know about Earth's environments and how they function. The principles outlined below are dealt with in much greater detail in the environmental curriculum development monographs, companion volumes to this guide. Each of the monographs deals with a single element of Earth's environment or a serious threat to its operation.

This outline is based on that found in *Fundamentals of Environmental Education*, a 1976 report of the Subcommittee on Environmental Education, Federal Interagency Committee on Education.

Fundamental Principles Dealing with Earth's Environment

When we try to pick out something by itself, we find it hitched to everything else in the universe.
–John Muir

A. **Earth's environment operates as a system supported by conditions that are functions of Earth's structure and place in the solar system.**
   1. Solar energy is the primary source of energy for all physical, chemical, and biochemical cycles and other processes occurring on Earth.
   2. Nuclear processes, geothermal sources, tidal movements, and gravity are secondary sources.
   3. Earth is in a state of overall energy balance, absorbing energy from the sun and radiating it into space.
   4. Absorption and distribution of solar energy result in the movement of global air masses, the hydrologic cycle, and ocean currents, giving rise to Earth's prevailing weather and climates and providing conditions essential to life on Earth.

B. **Earth's environment is a complex, interrelated, interactive, dynamic, constantly changing macrosystem called the ecosphere.**
   1. The ecosphere is composed of a mosaic of interacting systems called ecosystems.
      a. An ecosystem is a recognizable, homogeneous unit existing at a particular point in space and time, consisting of three groups of components: (1) physical (sun's energy, climate, rocks, water); (2) life forms (including humans); and (3) interactions

between living and nonliving components (competition, erosion, decomposition).

b. The characteristics of an ecosystem, derived from the interaction of its components, differ from the characteristics of individual components and can be understood only when studied as a complete functioning unit.

c. Characteristics of a species of organism depend upon interactions of its genetic composition with the environment.

d. Ecosystem processes are limited by physiochemical attributes (energy, materials, space, time) and the inherited characteristics of organisms.

e. These characteristics adapt a population of an organism to function in a particular role known as a niche. Populations of organisms are interdependent with one another and with their physical environment.

f. Both ecosystems and species of organisms vary in their ecological amplitude, that is, their parameters and capacities to interact with other components of the ecosystem, and with other ecosystems.

2. The ecosphere has and is undergoing continuous change.

a. Environmental factors, such as climate, topography, geologic processes, and the distribution of oceans and continents, have changed throughout Earth's history.

b. Organisms have changed greatly through many small consecutive modifications of their genetic composition, thus adapting to a changing environment. Organisms which have failed to adapt have become extinct.

c. New ecosystems are created as organisms invade formerly lifeless water or bare mineral substrates (such as rock), or as existing ecosystems are modified.

(1) New combinations of organisms and environments produce new ecosystems.

(2) Interactions of living and nonliving components change the character of an ecosystem.

(3) Natural and human processes, for example, fires, landslides, earthquakes, and urbanization, alter ecosystems in varying degrees.

(4) Ecosystems have various degrees of resiliency to alteration, giving them varying capacities and rates of recovery from alteration.

(5) Ecosystems can be reduced to near or actual extinction by the removal or addition of components and the change of processes, but unless the area is rendered toxic to all life for extended periods, a new ecosystem subsequently will develop.

d. As ecosystems persist and mature over time, there is a tendency toward an increase in the diversity of organisms.

(1) Mature ecosystems have a steady-state character even though individual organisms and species arrive, die, or

> *The beauty and genius of a work of art may be reconceived, though its first material expression be destroyed; a vanished harmony may yet again inspire the composer; but when the last of a race of living things breathes no more, another heaven and another earth must pass before such a one can be again.*
>
> *– William Beebe*

depart, and even though particular kinds of organisms may not always be present.

(2) Mature ecosystems tend to be very stable, with more resilience to physical, biological, economic, and social variations than developing systems.

e. Niches become more specialized as ecosystems mature.

(1) Niche specialization occurs when ecosystem changes interact with organism changes.

(2) Niches can be expanded if species learn new behaviors, thus enabling more types of organisms to live in an ecosystem and further modify its character.

f. Some ecosystem characteristics are influenced strongly by the origin and history of the ecosystem.

3. Energy and materials required for life pass into or are found in the ecosphere, and are components of each ecosystem.

a. Ecosystem energy comes originally and primarily from the sun; materials come from components of the ecosphere.

b. Green plants, through photosynthesis, use solar energy to convert water, carbon dioxide, and small amounts of minerals into high energy organic compounds that power all life processes.

(1) The process of respiration releases this energy in other organisms.

(2) The processes of photosynthesis and respiration are limited to a narrow range of temperatures, moisture, and chemical conditions, and by the genetic composition of organisms.

c. Materials are cycled and recycled through ecosystems via pathways known as food webs. In food webs materials pass through plants, through herbivores, and through carnivores. At any of these three levels, decay organisms may reduce organic matter to inorganic, thus completing the cycle.

d. Some energy moves through physical and chemical components of ecosystems; the rest through food webs.

(1) Energy conversions are never 100 percent efficient, so energy is constantly dissipated from the system, resulting in a deficit.

(2) A constant infusion of energy from the sun is required for organisms and ecosystems to live and to grow.

(3) Some energy is stored in organic materials and is available for future use.

c. Most natural ecosystems are adapted to operate on the energy and materials directly available to them. These resources are renewable through recycling.

(1) In natural ecosystems the rates of consumption and renewal are balance.

(2) In ecosystems containing primitive human social groups, these rates are also balanced.

(3) In ecosystems containing modern human social groups, there is a demand for heavy subsidization of energy and materials.

4. Each ecosystem of the ecosphere contains a number of species populations, the size and stability of which vary, depending on biotic and abiotic changes in the system.
   a. A population introduced into an ecosystem to which it is adapted shows a typically s-shaped pattern of growth as births exceed deaths, a leveling off as the rates equalize, and a decline as the death rate exceeds the birth rate.
   b. Population, birth, and death rates are influenced by intrinsic and extrinsic limiting factors.
      (1) Intrinsic factors are genetic and include reproductive capacity, innate behavior, food requirements, and resiliency.
      (2) Extrinsic factors are environmental and include chemical factors, such as nutrients and toxins; physical factors, such as temperature and humidity; and factors related to interactions with its own and other populations, such as competition, predation, parasitism. Population density affects all extrinsic relationships.
      (3) The modern human birth rate is affected primarily by socio-cultural means, for example, delay in marriage, contraception, abortion; the death rate by technology, for example, medical science, sanitation, dietary improvement. The net result of recent changes in both rates has been a substantial increase in the size and growth rate of Earth's human population.
   c. Population size in an ecosystem will vary over time with changes in physio-chemical factors and with biological interactions, thus defining a carrying capacity of the ecosystem for a population under a given set of conditions. Within finite limits, technology can increase an ecosystem's carrying capacity.
   d. Spatial arrangements and total numbers of individuals in a population are equally important in ecosystem functioning.
   e. Population distribution is controlled by ecological amplitude, environmental barriers to dispersal, and history.

> *The environment is not only more complex than we think; it is more complex than we* can *think.*
>
> *– Unknown*

Fundamental Principles Dealing with Humans as Ecosystem Components

A. Humans use ecosystems to satisfy basic needs and desires.

1. Basic biological needs that must be met for humans to live and grow include habitable climate, energy, materials, rest and

exercise, other humans for reproduction, and protection against environmental stresses.

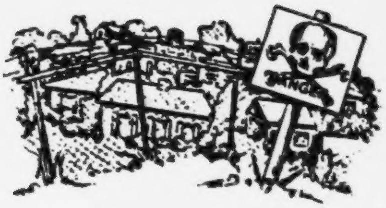
2. Humans cannot grow and completely develop mentally unless essential psychological and social needs and desires are met. These include security, love, esteem, self-fulfillment, social interaction, health, comfort, material goods, and religious experiences.
3. Each human culture has its own perceived needs and desires that make different demands and impacts on ecosystems. In times of stress many of these needs and desires can be adjusted.
   a. Culturally specific perceived needs include
      - —preservation of land, ecosystems and species, and the conservation of materials and energy;
      - —satisfaction of desires for status and for exotic materials and experiences;
      - —economies of scale concentrating human activities;
      - —planned obsolescence of manufactured goods; and
      - —dietary customs, family size, and work attitudes.

   b. Universal human desire for increasing amounts of material goods is expressed differently in different cultures. The human impact on ecosystems increases as these desires are satisfied.

   c. Value systems are an important factor in determining the kind and extent of a society's impact on ecosystems.

   d. Increasing the consumption of energy and materials often leads to deleterious impacts on ecosystems such as
      - —increased CO_2 and heat in the atmosphere, resulting in heat islands over cities;
      - —changes in the reflective power of Earth;
      - —introduction of synthetic substances that may be toxic, mutagenic, or carcingenic.

   e. Concentration of humans in built environments intensifies the deleterious effects of humans on ecosystems.



B. Humans are an all-pervasive species in the ecosphere and thus exert a special ecological dominance.

1. Human domination results fromvarious factors.
   a. Intellectual capacities permit the development of
      - —technology, giving unique control over energy flow, food and goods production, disease, and other factors that could limit human populations;
      - —unique institutional and technological control over other populations in ecosystems such as the domestication of species, suppression of undesirable species, and the encouragement of desirable species.

   b. Biological and cultural adaptation to a wide range of environmental conditions may result in either positive or negative effects.

   c. Sheer population size results in domination.

        d. Specialization and diversity in the division of labor allows for domination.
    2. Human tendencies to form and function in social and corporate groups and institutions promote development of human habitats that create unique concentrated demands on ecosystems and further increase human effects on ecosystems.
        a. These effects are intensified by the concentration of humans in small areas.
        b. The effects of human settlements on a metropolitan scale on ecosystems rival those of mountains, glaciers, droughts, and floods.
    3. Recent rapid increases in human populations and technological capabilities have accelerated ecosystem changes until some are potentially irreversible.
    4. Human aesthetic, ethical, moral, and spiritual values may reinforce or conflict with harmonious relationships within ecosystems.

C. Ecosystems affect humans

1. Humans and all their products function in an ecosystem framework.
    a. Built environments radically transform human societies and cultures.
    b. Past ecosystem processes and events have produced major biological and cultural differences in human populations.
2. Ecosphere changes due to increasing human population and technology have both short and long term effects.
    a. Short term effects include changes in
        — birth and death rates;
        — biological fitness of human populations as measured by growth rates, disease patterns, nutritional levels, and aging;
        — use of nonrenewable material and stored energy resources; and
        — functional capacities of individuals and populations, for example, mental productivity and attitude.
    b. Long term effects include changes in
        — genes and chromosomes and their evolutionary consequences;
        — elimination or introduction of selection pressures;
        — ecosystems due to evolution of component populations;
        — health and life cycles;
        — global climate;
        — reserves of nonrenewable and renewable resources; and
        — culture.
3. The built environment and its psychological milieu have a powerful effect on humans. Information transfer by verbal communication and learned behavior operates on humans in a parallel and synergistic manner in much the same way as do physical and chemical components of ecosystems.

> *If human beings were to disappear from earth, the other species of plants and animals would be largely unaffected; if the other plants and animals were to disappear, however, human beings would disappear as well.*
>
> *– Bruce Wallace*

D. Complex interactions among humans and other ecosystem components occur continuously.

1. **Humans' perceptions of their needs, their impacts on ecosystems, and ecosystem impacts on them reflect the cultural and individual values, goals, skills, insights, and capabilities of the individuals, groups, institutions, and nations involved.**
2. **Relationships among components of ecosystems are reciprocal, ranging from mutually beneficial to unidirectionally destructive.**
3. **Feedback mechanisms of different kinds, for example, physical, chemical, social, behavioral, ranging from rudimentary to highly sophisticated, govern relationships among and within components of ecosystems.**
4. **Human activities often have synergistic effects on ecosystems and vice versa.**
5. **Human activities affect ecosystem maintenance and management.**
    a. **Potentially positive activities of humans within ecosystems include**
        —**domesticizing plants and animals;**
        —**reducing of disease and mortality;**
        —**constructing and controlling space for living, working, manufacture, storage, recreation, and transportation;**
        —**preserving genetic stocks of nondomesticated organisms and preservation of specific ecosystems;**
        —**appreciating ecosystems and their components;**
        —**developing human law and property rights;**
        —**reducing human populations under certain social-cultural conditions; and**
        —**elaborating functional roles for humans, which increases diversity of ecosystems.**
    b. **Potentially destructive activities of humans within ecosystems include**
        —**bringing on large scale events, (such as oil slicks, floods, atmospheric changes) that warn of imbalances between human activities and ecosystem functions;**
        —**reducing the number of individuals in a species; interrupting the continuity or reducing the area of ecosystem types and reducing the average species diversity for a given ecosystem type;**
        —**increasing environmentally-related human health problems, such as pollution-induced disease, noise-induced deafness;**
        —**deliberately or inadvertently destroying or modifying habitats;**
        —**creating and concentrating pollutants;**
        —**dissipating energy and producing pollutants at high rates in urban areas;**
        —**depleting relatively concentrated sources of raw materials.**

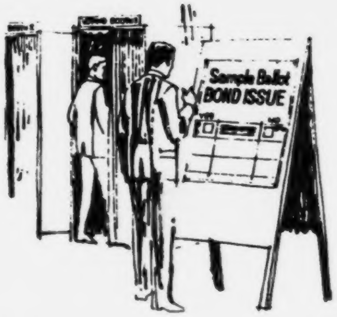
> ***Environmental degradation in all its forms is everybody's business; its control will require a massive mobilization of public, administrative, and scientific concern.***
> ***–Rene J. Dubos***

Methods for Harmonizing Human Activities with Ecosystem Processes to Achieve Environmental Quality

The universe is so successful, I simply want to learn its principles and apply them rather than to exploit it blindly and fear for survival.
–R. Buckminster Fuller

A. Methods by which human activities, local through global, are harmonized with ecological processes are complex, and outcomes are not always predictable.

1. Barriers to harmony include
   - —inevitable, continuing, and largely unmanageable effects of ecosystem changes on human biology and culture;
   - —incomplete or unavailable detailed knowledge needed to make environmental predictions;
   - —uniformly dependable social-political processes for responsible decision making.
2. Harmony can be pursued through
   - —formal and nonformal education of the public;
   - —practice of various art forms to develop human sensitivity to and appreciation of environmental quality;
   - —encouragement of corrective actions by individuals, business and industry, citizen organizations, and government agencies;
   - —voluntary adoption and implementation of policies and standards;
   - —establishment of formal policies, guidelines, and standards;
   - —use of economic and social incentives;
   - —enforcement of policies, guidelines, and standards.
3. Institutions, processes, and attitudes for promoting harmony include
   - —education and communication;
   - —religious, aesthetic, ethical and moral influences;
   - —science and technology;
   - —civic and social institutions;
   - —government and political processes;
   - —industry and commerce.



B. Basic procedure for harmonizing human activities with ecosystem processes can be described as a series of steps.

1. Investigate ecosystem processes and components, including the effects of human activities on ecosystems and the influences of ecosystems on human functioning.
2. Recognize the importance of ecosystem processes and the significance of ecosystem changes.
3. Identify the causes of ecosystem changes and their consequences.
4. Develop alternative action strategies to maintain and enhance beneficial ecosystem changes and to reduce detrimental changes, with special attention to irreversible changes and to long range versus short range commitments of resources.

The object of our game
with nature is not to win,
but to keep on playing.
– Unknown

5. Analyze and evaluate alternative action strategies within a broad array of environmental, social, and economic criteria, recognizing that criteria will differ according to circumstances of politics, geography, scale, time, and society.
6. Select among alternatives, actions, and strategies, and adopt a policy which can be implemented at all levels, individual through global.
7. Decide on and complete actions to implement the policy.
8. Monitor and evaluate effects of the implemented policy.
9. Feeding information gained in step 8 back through step 1 to adjust actions to changing data bases, requirements, conditions, and perceptions.

3

Introduction

Ultimately all human values are dependent on inborn demands to satisfy biological needs—the basic requirements for survival. The fundamental principle of all ethical/moral systems is self-preservation, the right of survival. It is primary to other higher ethical principles such as individual worth, human equality, and human dignity. Likewise, it must precede the establishment of value or worth in any other areas of human concern (for example, aesthetics, economics, or politics). But satisfying biological needs—food, water, shelter, clothing—places demands on the environment. Thus, values education and environmental education are linked by this most elemental requirement of human existence. Both are concerned with the primary question of how the environment is to be used in providing for survival. In their furthest extension they are each linked to an ultimate concern for survival of the planet.

Stages of Value Development

Every free action has two causes which concur to produce it: one moral—the will which determines the act, the other physical—the strength which executes it. When I walk towards an object, it is necessary first that I should resolve to go that way, and secondly that my feet should carry me.
-Jean Jacques Rousseau

Education providing for value development may be viewed as progressing through the following five stages:

Stage 1. Early value development in children is based on the satisfaction of their needs, interactions with significant adult models, and inculcation with certain values necessary to survival. Issues at this stage of development are seen as good or bad, right or wrong, beautiful or ugly, based on their role in satisfying needs and on models provided by adults. Social and environmental interaction at this stage is limited. Key institutions that influence early value development are the home, child care facilities, and, later in this stage, schools.

Stage 2. As the child's interactions with the environment increase, and the child becomes more independent of adult care, the child is influenced by an increasing number of perceptions and ideas. Feelings of pleasure or displeasure increase beyond immediate satisfaction of needs. The child has a greater ability to interact with and thereby influence and be influenced by individuals and things, and has greater use of the senses to perceive the environment. The child develops an understanding that others have feelings and sensitivities, and that personal feelings are associated with a sense of self-worth. The child feels more worthy when there is a feeling of pleasure than when feeling pain or perceiving displeasure from others.

Children at this level begin to realize that not everyone sees the same things as good or bad, right or wrong, beautiful or ugly, and that issues are not resolved simply by satisfaction of personal needs. This is very important to the later development of the child. The child begins to develop empathy for others and realize that personal actions affect others. Key institutions influencing the child include the home, school, neighborhood, media, and the church.

> *Instead of implying that the ideals we cherish are safely embalmed in the memory of old battles and ancestral deeds, we should be telling [young people] that each generation refights the crucial battles and either brings new vitality to the ideals or allows them to decay . . . .*
>
> *– John W. Gardner*

Stage 3. As children mature, an even larger array of social and environmental influences is experienced. Children become more aware of belonging to a larger community as social participants and the need to establish a personal order to this new world. They become aware of the need for group decision making, rules of behavior, and patterns of interaction as well as economic considerations in satisfying their own and others' wants and needs. Action is now more clearly considered as a means to influence the decisions of others and to control their personal environment. At this level of development, children may see many alternative rights and wrongs, goods and bads, beautifuls and uglies, and may consider each equally acceptable or reasonable. There is an increasing ability to imagine how others may feel and to consider issues by assuming the role of others. Intent is an important consideration in determining right or wrong, good or bad, and things may be considered good if based on good intentions, even if the results are not good.

Decision making is viewed as involving a larger community of individuals, as applying the laws or rules of the larger community, and determining new laws or rules by vote of the majority, or by accepting the dictates of individuals designated as superiors or leaders by concurrence of a larger group. At this stage children may find comfort in avoiding confusion by following accepted patterns, rules, or laws of a primary group to which there is an established allegiance. Issues are viewed as having alternative solutions each with pros and cons, but personal decisions are generally abandoned to comply with group decisions. Dominant institutions influencing the child at this stage include the home, school, primary groups of allegiance, the church, and the media.

Stage 4. Children at the next level of development begin to make the distinction identified by John Dewey as the distinction between "the desired and the desirable." The desirable is distinguished as being the product of critical reflection and judgment. In making the transition to this stage, relationships are extended beyond concern for personal needs and wants and the needs and wants of one's primary group of allegiance. Children develop the ability to use reason as a tool in making judgments among competing personal claims, among competing claims of other people, and in achieving defendable positions on issues. As the ability to do so improves, there is greater social and environmental harmony and a greater use of group consensus. As an ultimate goal, children who have progressed to this level seek universal consensus and harmony in the resolution of global issues. Dominant influences are formal education, religious, and social institutions, scholars; philosophers; and the media.

If we can change our priorities, achieve balance and understanding in our roles as human beings in a complex world, the coming era can well be that of a richer civilization, not its end.
– Sigurd F. Olson

Stage 5. The final level of development is achieved when the individual realizes the fallibility of human reason and the possibility of error even in those decisions made after the most careful and rational deliberations. This level of development is concerned with the pursuit of the ideal and the discovery of ultimate, universal principles for determining the good and the bad, the right and the wrong, the beautiful and the less beautiful. At this level, decision making is concerned with a dedication to continuous critical reflection upon judgments made. Also, there is great concern with the processes of decision making, with the aim of achieving a more powerful and ideal resolution of issues in order to achieve utopian levels of harmony among individuals and the environment they share. This final level of development is the ultimate goal of education and associated social institutions such as the church.

Taxonomies of Objectives in Value Education

Values, at least in part, are related to or actually arise from feelings or emotions and therefore fall into the realm of the affective domain.

The taxonomy of educational objectives in the affective domain (table 3), developed by Krathwohl and his associates, has been an important influence on those working in the area of affective education since it was introduced in 1964.

■ Table 3

Taxonomy of Educational Objectives: Affective Domain*

- **1.0 Receiving (attending)**
  - 1.1 Awareness
  - 1.2 Willingness to receive
  - 1.3 Controlled or selective attention
- **2.0 Responding**
  - 2.1 Acquiescence in responding
  - 2.2 Willingness to respond
  - 2.3 Satisfaction in response
- **3.0 Valuing**
  - 3.1 Acceptance of a value
  - 3.2 Preference of a value
  - 3.3 Commitment (conviction)
- **4.0 Organization**
  - 4.1 Conceptualization of a value
  - 4.2 Organization of a value system
- **5.0 Characterization of value or value complex**
  - 5.1 Generalized set
  - 5.2 Characterization developing a consistent philosophy of life

*after Krathwohl, Bloom, and Masia (1964)

In recent years increasing concern has been shown for the interrelationships among cognitive, affective, and psychomotor educational objectives. Pierce and Gray have identified six levels of classification common to each of the three domains (table 4).

Table 4

Classification Levels for Educational Objectives: Cognitive, Affective, Psychomotor Domains*

1. Perceiving
2. Understanding – Reacting – Activating (attempting to control or organize information, emotional or sensory reactions, or physical actions)
3. Applying – Conforming – Executing (applying or using already developed rules, standards, or skills to achieve desired ends)
4. Analyzing – Validating – Maneuvering (analyzing new problems by comparing them with previous problems which have already been resolved and selecting appropriate resolutions from this process of comparison)
5. Judging (establishing criteria by which to make a judgment, gathering appropriate data, and making a logical or rational judgment based on the criteria and data)
6. Creating (engaging in an insightful moment of creation of a unique or new resolution to a problem)

*After Pierce and Gray (1979)

These taxonomies can be used to develop objectives for value development in environmental education. They share an emphasis upon awareness (perception) and understanding as the starting point for value development. They also share a sequence that is increasingly sophisticated and rational in its approach to value decision making.

Other models for curriculum objectives in the affective domain have been developed, including several models for the related areas of ego development and character development, and can be found in reviews of literature in this area (see Appendix E).

Teaching Strategies for Value Development

Five general categories of teaching strategies for value development have been identified.

- Awareness activities
- Values clarification strategies
- Values analysis strategies
- Social action activities
- Cognitive moral development strategies

In the following section each of these strategies is described, and their application to environmental education content is illustrated.

Awareness Activities

Awareness activities develop the child's sensitivity to the existence of certain stimuli—to the existence of things in the environment and the feelings these things stimulate in oneself. Awareness activities not only introduce the child to the presence of something, but they develop the child's willingness to receive stimuli through the senses. They provide the child with methods of perceiving the world and responding to it.

Awareness activities often involve contrived experiences so that the child can more easily distinguish something about a particular object or event. For example, a child may be blindfolded and then brought into contact with a tree in order to heighten an awareness of the distinguishing characteristics of the tree's bark, branching arrangement, and leaf structure.

Awareness is generally associated with the first and second levels of affective development (tables 3 and 4). However, it is important to realize that awareness exists at various levels of sophistication from the simple admission of being in the presence of something to the more sophisticated concern for the distinguishing characteristics and details of an object and the attention to the special nuances of the thing that make it stand out as unique in the world. One of the keys to effective use of awareness activities is to avoid bringing a child into the presence of something and introducing it by name. Names serve to block the identification of unique characteristics. A child's being able to recite a name may mean only that the name is understood. Instead of relying on naming a thing, it would be better to ask questions that will focus student attention on unique characteristics—characteristics that can be perceived by use of a variety of senses. Examples of such questions are listed below.

- What color is it?
- How many feet, branches, petals, leaves, berries, or colors does it have?
- How large is it?
- What patterns do its colors make?
- What is it shaped like?

- What else does it look like?
- How does it smell?
- Does it smell like something else you know of?
- Can you hear it?
- What kind of sound does it make?
- How do you think it makes that sound?
- What does it feel like?

See Appendix E for sources of awareness activities.

Values Clarification Strategies

Values clarification strategies emphasize valuing, a series of processes and subprocesses.

- Making choices freely
- Discovering, examining, and choosing from alternatives
- Considering thoughtfully the consequences of each alternative
- Prizing and cherishing choices
- Affirming choices publicly
- Acting, behaving, and living in accordance with choices
- Acting repeatedly on choices, in some pattern of lives

The proponents of values clarification strategies regard making choices freely as the first step in the creation of values. The making of choices enables the individual to establish further an identity by expanding self-awareness and opportunities for new experiences and by developing personal uniqueness and talent. The individual is free to change the environment to meet his or her own needs, but must use all available resources—including rational and emotional processes, conscious and unconscious feelings, and mind and body functions—to accomplish the change.

Although the objectives for values clarification strategies are quite extensive, in practice most values clarification activities involve making choices, publicly affirming choices, and, to a limited extent, examining choices made repeatedly. Most values clarification activities do not involve extended discussion or examination of questions or choices, and do not require much investment in the choice by the individual. Therefore, values clarification activities should not be considered terminal activities in the process of value development in environmental education.

Values clarification strategies incorporate a wide variety of techniques for value development. Strategies may include large and small group discussions, individual and group work, hypothetical and real dilemmas, rank order and forced choices, sensitivity and listening techniques, songs, artwork, games, simulations, personal journals, and interviews.

Teachers using values clarification strategies should respond to students in ways which encourage students to consider their own choices, value decisions, and actions. Their responses should not be attempts to gather data but rather to stimulate students to review ideas or behavior and thus clarify values or considerations of the worth of things. Teachers should not try to evaluate, criticize, or moralize about student reactions.

Values clarification strategies can be useful in instructional situations to stimulate student thinking about the impact of their personal life style choices on other life forms and the environment. Values clarification activities can help to direct attention to elements of the environment that are prized, those that are important but taken for granted, and those that previously may not have been considered important. Skillful use of these strategies can stimulate students to clarify their own ideas and actions. *However, reliance on this approach alone may result in student's clarifying that they really enjoy and cherish activities that are destructive to the environment.*

The following is an example of one type of values clarification activity adapted for environmental education.

Example 1

Value Voting

Directions: The teacher reads aloud one by one questions which begin with the words "How many of you . . .?" After each question is read the students take a position by show of hands. Those who wish to vote in the affirmative raise their hands. Those who choose the answer negatively point their thumbs down. Those who are undecided fold their arms. And those who want to pass simply take no action at all. Discussion is tabled until after the teacher has completed the entire list.

How many of you

- enjoy snowmobiling?
- enjoy ice skating?
- enjoy ice fishing?
- enjoy cross country skiing?
- enjoy the silence of a winter evening?
- drive your car almost everywhere you go?
- like to walk?
- like to ride a bicycle?
- prefer polyester or synthetic clothing?
- keep your thermostat at 68 degrees or lower in the winter?
- have travelled by train or bus in the last year?
- car pool whenever you have a chance?
- prefer taking a bath to a shower?
- believe there is an energy shortage?
- are concerned about the depletion of our natural resources?
- buy soft drinks in non-returnable containers?
- are concerned about your personal waste of natural resources?
- have visited a sanitary waste disposal facility?
- attempt to recycle natural resources?

After a discussion of the issues, another vote might be taken to determine resulting changes in positions.

Value Analysis Strategies

Value analysis strategies emphasize rational, logical value decision making. The procedures used emphasize concept analysis, the logical validity of arguments, consideration of the consequences of decisions, and the consistency of judgments. Defining the value object, collecting facts, judging the validity and relevance of facts, determining the importance of facts to the individual, and testing the acceptability of value rules are primary processes emphasized in value analysis strategies.

Value analysis is organized as six processes.

1. Identify and clarify the value question.
2. Gather and organize facts or statements claimed to be facts about the value question.
3. Assess the validity of facts.
4. Determine that the facts are related to the value question.
5. Arrive at a possible decision or solution.
6. Decide if the possible solution or decision is acceptable to the individual or individuals making the decision.

In contrast to the values clarification strategies, values analysis emphasizes the subordination of feelings and emotions to logic and rationality. The object of value analysis is less focused on self-awareness and more focused on the resolution of value conflicts or social issues according to logic, science, and rationality.

A number of different value analysis approaches have been identified, and several have resulted in the development of classroom materials primarily for use in social studies classes. Example 2 applies the six steps of values analysis to a value issue of concern to environmental educators.

Value analysis strategies are useful in interdisciplinary studies. The emphasis on point of view, definition, and fact gathering provides for application of skills and content from a number of sciences and social sciences. The emphasis upon making policy decisions provides for the development of important social studies skills. The six steps provide a sequential guide to investigation, analysis, and logical decision making. And, the four tests outlined in example 2 provide skill in judging consistency of positions and questioning decisions advocated by others. However, the emphasis upon rational decision making and taking the role of others precludes the use of value analysis activities until children have achieved the third or fourth level of affective development.

■ Example 2

Applying Value Analysis to an Environmental Issue

Returnable Container Legislation

The enactment of returnable container legislation has been considered at the state and national levels for a number of years. Many states have already enacted such laws.

Step 1. The policy question under consideration is, "Should returnable container legislation be enacted?" Clarifying this question requires that returnable container and applicable beverages be precisely defined. In Iowa the beverages for which returnable container legislation applies are identified as "beer, other alcoholic malt beverages, mineral water, soda water, and similar carbonated soft drinks in liquid form and intended for human consumption." Beverage containers are identified as "glass, plastic, or metal bottles, cans, jars, or cartons, containing a beverage."

These definitions serve to identify evidence that may or will be considered in making a decision on the value issue. Only facts concerning beer or malt liquors, mineral water, soda water, and carbonated soft drinks packaged in glass, plastic, or metal bottles, cans jars, or cartons are to be considered, unless the agreed upon definitions are modified.

Step 2. Gather facts or statements purported to be facts about the value question. Usually facts are organized by the dominant points of view. In the case of returnable container legislation, dominant points of view may be related to economics, aesthetics, health, and politics. Facts concerning the impact of returnable container legislation on employment, cost of beverages, facilities for storage, and consumption of natural resources in container production are concerned with the economic point of view. Facts concerned with the appearance of litter along the countryside, in parks, and along roadways are related to an aesthetic point of view. Facts concerned with the problems of transmission of germs and related diseases by reusable containers are related to a health point of view. And, facts related to public support for or against returnable container legislation is related to a political point of view.

Step 3. Assess the truth of statements claimed as facts. Facts about the sanitary conditions of returnable containers, the effect of returnable container legislation upon employment, and the costs of storing returned containers for retailers may be supported by questionable or conflicting evidence.

Step 4. Show that facts are related to the value question. This involves using the collected facts to develop a logical conclusion to the value question.

Step 5. Arrive at a possible solution. The facts are inserted as the minor premise in a logical syllogism; the conclusion is the decision on the value question. The process is illustrated below.

- *Major Premise*: Legislation that will result in increased consumer costs should not be enacted.
- *Minor Premise*: (FACT) After passage of returnable container legislation the price of beer rose slightly in Vermont and Oregon.
- *Conclusion*: Returnable container legislation should not be enacted.

Each combination of major premise (value rule), minor premise (fact), and conclusion provides for a decision on the value issue. The individuals making the value judgment need to consider the value rules and points of view important to them. Tentative value judgment, or conclusion, should be supported by facts related to the value rules and points of view considered important.

Step 6. Decide if the tentative judgment is acceptable to the individuals making the decision. This is accomplished by administering the following four test.

- *New cases test*—involves applying the value rule or major premise on which the decision is based to other similar cases. The purpose is to determine if the individuals are consistent in using the value rule as a guide for making value decisions. For example, the value rule, "Legislation that will result in increased consumer costs should not be passed," can be tested by asking, "Do you also oppose taxes on cigarettes and alcoholic beverages?" or "Do you oppose all sales taxes?"
- *Role reversal test*—asks the individuals applying a value rule to hypothetically exchange places with someone adversely affected by that value rule. The point of the test is to determine if the individuals would accept the rule even if they were adversely affected by the rule. For example, the same rule concerning legislation that increases consumer costs could be tested by asking, "Would you accept this rule even if you were an operator of a bottling plant who would benefit in increased profits from this legislation?"
- *Universal consequences test*—asks the individuals applying the value rule if they would accept the rule if everyone applied it to all similar cases. For example, the value rule concerning legislation that increases consumer costs would be tested by asking, "Would you agree if everyone applied this rule to all cases? For example, this would mean legislation providing for collective bargaining for any employees would not be allowed, increases in salaries of state employees would not be allowed, and increased taxes to pay for schools or teacher salaries would not be allowed."
- *Subsumption test*—seeks to determine if the value rule being applied is logically deduced from a more general value principle held by the individuals making the decision, or if it conflicts with a more general value principle held by the individual. For example, the value rule concerned with legislation that increases consumer costs might be claimed as a value rule that is subsumed under the more general principle, "Legislation should provide for the general welfare of the people."

Social Action

Social action activities stress community rather than classroom-based learning. The activities provide opportunities for students to act on the value decisions they have made and make positive changes in their environment. They emphasize the development of interpersonal and group skills, both within the school community and the larger community outside the school. Therefore, they are applicable at the third and fourth levels of affective development.

The following six steps have been identified in the social action approach to value development.

- Become aware of the problem or issue.
- Understand the problem or issue and take a position (includes those processes identified in the earlier discussion of value analysis).
- Decide whether to act.
- Plan strategies and action steps.
- Implement strategies and take action.
- Reflect on actions taken and consider next steps.

The solution to the environmental crisis . . . rests neither with scientists nor with government officials, but with a citizenry educated in environmental problem solving.
– Donald Hawkins
– Dennis Vinton

The six steps include many of the same activities included in value analysis and values clarification strategies. However, they take these activities to their logical conclusion of determining and implementing personal action. The movement to action necessarily requires active participation by the classroom instructor. Students are likely to lack experience in determining alternative forms of action, judging the consequences of those actions for themselves and others, planning and organizing individual and group actions, and assessing the results of their actions in leading toward resolution of the issue or problem.

Social action activities are potentially the most valuable learning experiences students can have. They provide students an opportunity to participate as active citizens in their school or community and to gain practice in important political participation skills. The development of these skills is essential for future active citizenship participation.

Environmental issues or problems provide a natural focus for social action activities. The resolution of most environmental issues or problems requires personal and local community action, as well as state or national legislation. For example, the various environmental and natural resource issues involved in returnable container legislation provide opportunities for students to engage in a variety of research and political activities. But, the issues and their resolution can also involve personal action at the school or local community level. Students can decide not to purchase beverages in nonreturnable containers; they can lobby the school administration and school board to remove all machines dispensing nonreturnable containers from local school buildings; they can lobby local government to remove machines dispensing nonreturnable containers from city properties. Students can also lobby their family and friends to join them in a boycott of nonreturnable containers. Through social action students may have an opportunity to learn that individual action, including persuading others to act with them, is easier and just as effective as the more difficult task of influencing action at the state or national level.

Cognitive Moral Development Strategies

The basis for moral development strategies is Lawrence Kohlberg's theory of cognitive moral development (Kohlberg, 1969). The theory maintains that moral development is a long-term process and involves movement through six stages which roughly correspond to the four levels of cognitive development identified by Jean Piaget. Movement from one stage to the next is stimulated by recognition of the inadequacies of reasoning or the presence of cognitive conflict at a current stage of reasoning and seeing greater adequacy of another higher level of reasoning. The six stages are briefly described below.

Stage 1. Because of the physical form or the consequences of the act, motives of an act are ignored in judging the goodness or badness of the act. In environmental issues, stage 1 reasoning is likely to focus on the costs or consequences of a particular action rather than the general issues; for instance, an oil spill may be judged bad because of the damage to a beach, but the general problems of oil consumption or waste and environmental pollution are overlooked.

Stage 2. An act is judged on its instrumental value rather than on its consequences. Nuclear power plants may be judged on the basis of their value in producing energy and their effect on the energy prices, not on the potential dangers in their operation or in the disposal of their waste products.

Stage 3. An act is evaluated on the basis of the type of person likely to perform the act. Littering may be judged bad because people who are sloppy or people who don't care are likely to litter, while people who care pick up litter.

Stage 4. An act is always wrong, regardless of motives or circumstances, if it violates a rule or law and does forseeable harm to others. Exceeding the 55 mile-per-hour speed limit is bad because it breaks the law and may cause an increase in accidents, but is not considered bad on the basis of excess energy consumption.

Stage 5. Although circumstances or motives may modify disapproval, as a general rule the ends do not justify the means. The need to develop alternative sources of energy may modify the disapproval of strip mining, but it does not justify the destruction of land areas resulting from strip mining; the general rule that destruction of land resources is wrong continues to hold.

Stage 6. An act is right if it results from a decision to follow general, self-chosen principles. Violation of the rules may be justified if the choice is between deviation and concrete violation of a moral principle. In environmental issues, stage 6 reasoning is exemplified by the decision to follow general, self-chosen principles concerned with preserving natural resources for future generations.

Therefore, classroom strategies involve providing students with a climate in which they experience and practice moral choices and discuss the reasons for these choices. Generally, classroom strategies are centered around the presentation of hypothetical dilemmas or problem situations which involve conflict in the role expectations of two or more individuals, and the resulting peer group discussion about possible solutions to the dilemma and reasons supporting each proposed solution. However, some moral development strategies involve an action orientation.

Teachers can develop their own moral dilemmas and encourage students to discuss or role play them, thus stimulating students to view environmental issues in increasingly more general and flexible ways. Suggestions are offered regarding developing moral dilemmas.

- Build the dilemma so that it contains a real choice and a variety of plausible alternatives.
- Use real-life problems whenever possible. Keep a file of news articles for possible use as dilemmas.
- Focus on the choice to be made and not the detailed evidence of the case. The story that develops the dilemma should be simple, interesting, and short. Unnecessary details should be excluded.
- Construct a focus question that poses the choice to be made.
- Provide a situation that presents a genuine conflict and choice of actions. Do not use a story that has a moral. If the right answer or the answer that is accepted by the instructor is obvious, then it is not a dilemma.
- Ask questions about the choice, the reasons for the choice, and alternatives to the choice.

Conclusion

Teachers interested in value development in environmental education would be wise to review the theories and processes of the various alternatives available. They should also recognize that the strategies and activities are not exclusive and that the choice of strategies should be dictated by the objectives of instruction.

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Krathwohl, David R., B. S. Bloom, and B. B. Masia. *Taxonomy of Educational Objectives: The Classification of Educational Goals: Handbook II: Affective Domain.* New York: David McKay Company, 1964.

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4

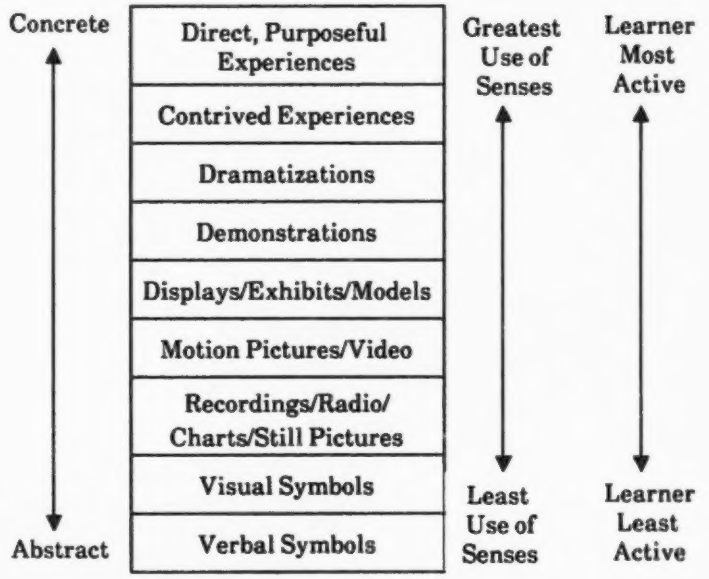
Types of Approaches

There are many types of educational experiences from which teachers can select to help their students learn about the environment. Some are abstract and symbolic, others are much more direct and concrete. One representation of these experiences is shown in figure 2, arranged from the most abstract to the most concrete. In such an array a transition from the least use of the senses and the least learner activity, to the greatest use of the senses and the greatest learner activity is also evident.

What ultimately makes education environmental is not its subject matter, but its procedures.
–Noel McInnis

Figure 2

Approaches to Teaching and Learning*


Concrete
Abstract
Direct, Purposeful Experiences
Contrived Experiences
Dramatizations
Demonstrations
Displays/Exhibits/Models
Motion Pictures/Video
Recordings/Radio/ Charts/Still Pictures
Visual Symbols
Verbal Symbols
Greatest Use of Senses
Least Use of Senses
Learner Most Active
Learner Least Active

* From Edgar Dale, *Audiovisual Methods in Teaching*, 3d ed. New York: Dreyden Press, 1969.

Direct purposeful experiences are those in which the learners have an opportunity to use the senses—hearing, tasting, seeing, touching, and smelling—to build up a wealth of meaningful information. Direct, purposeful experiences with real educational value are enjoyable to children and lead them purposefully to the achievement of a goal. Through direct participation students become partly responsible for achieving that goal. One other benefit of direct purposeful experiences is that they maximize the opportunity for learners to feel, to react emotionally to the experience, and to develop awareness and sensitivity.

Contrived experiences are edited so as to omit certain elements of a real experience and thus make it easier to understand. The editing may reduce the size or the complexity, or both, of the the real life situation. For example, an experience utilizing models is probably a better way to teach city planning than an actual experience of traveling through traffic over miles of streets and viewing scores of buildings and other elements of a city. The model meaningfully summarizes and condenses a great deal of specific information, making the area of many square miles easy to see and comprehend. However, an excursion of limited duration into a city provides a more direct experience for students and is a powerful learning experience. Likewise, an aquarium may contribute greatly to understanding the ecology of a pond, but the real thing should also be experienced.

The First Law of Environmental Education: An experience is worth 1000 pictures.
–Noel McInnis

Dramatized experiences can help children experience ideas or events that they cannot experience first hand. Dramatizations, like contrived experiences, omit some of the unimportant and confusing elements of a situation and stress the significant ideas. Students can participate in dramatizations in two ways—by acting out a part or by watching others act. The intended message may be conveyed to the student through either method. Role playing helps students develop a sympathetic understanding of other people, thus gaining new insights into their own lives. By acting the part of another person, students become more aware and develop empathy for the position of a person embroiled in a difficult situation. Role playing is an important part of many simulation activities.

Demonstrations are visualized explanations of important facts, ideas, processes, or techniques, generally done by one person before a group. A demonstration is often performed because it is not expeditious to provide individual or even small groups of students with the materials and equipment needed. Time and safety factors may also influence a decision to use a demonstration as an alternative to some other approach.

Demonstrations may include teaching approaches from other parts of the array in figure 1. A good demonstration often involves a dramatic presentation on the part of the instructor, using models, mock-ups, specimens, objects, still pictures, motion picture films or video presentations, computers, and chalkboard.

Displays, exhibits, and models are somewhat self-teaching. They may use photographs, models, charts, posters, audio-visual equipment and materials, computers, and frequently the actual objects. Spectators might be provided an opportunity to utilize their senses to varying degrees and thus greatly enrich the experience. The construction of displays, exhibits, and models by students provides them with direct, purposeful experiences. Viewing the exhibit, however, is a relatively abstract activity.

Displays, exhibits, and models may be used in a variety of ways—to introduce a unit or activity, to transmit information to students, or to serve as a summation activity at the end of a unit or series of lessons.

I hear and I forget. I see and I remember. I do and I understand.
Ancient Chinese Proverb

Motion pictures and video compress both time and space, thus omitting unnecessary and unimportant material and allowing concentration on selected key points. Furthermore, the use of slow motion photography may be used to show fast-moving processes too rapid to be seen at normal speeds, and time lapse photography may be used to condense and accelerate slow movements.

The use of broadcast television to present events occurring at the moment such as a pesticide hearing or flooding river, does not compress time and space but provides for an emotional element.

Recordings, radio, charts, and still pictures often convey a message which can be understood by people who cannot read and thus useful when working with young children. With groups of students, audio-visual devices such as filmstrip projectors, overhead projectors, opaque projectors, or tape recorders may be used—sometimes in combination. (Sometimes, though, a photograph may be too complex and include too many ideas to be useful. In such cases, simple drawings may be substituted.)

Visual symbols and verbal symbols (described below) are the most abstract approaches to teaching and learning. Very little immediate physical activity is involved in these types of experiences. Visual symbols include an old fashioned school bell to represent the location of a school building on a map, a stork or red cross to represent a hospital, a black line to represent a road, a blue line to represent a stream, green coloration to represent forested areas, printed numbers, and letters combined to form words.

Verbal symbols and visual symbols are separated by a fine line, if at all. A spoken word, such as ecosystem, is a verbal symbol, while the printed word, ecosystem, is a visual symbol. Verbal symbols may represent a concretion (tree), an idea (population control), a scientific principle (the law of gravity), a formula ($E=MC^2$), a moral principle (Leopold's Land Ethic), or any other symbolic representation of experience.

Selecting Approaches for Education in the Cognitive Domain

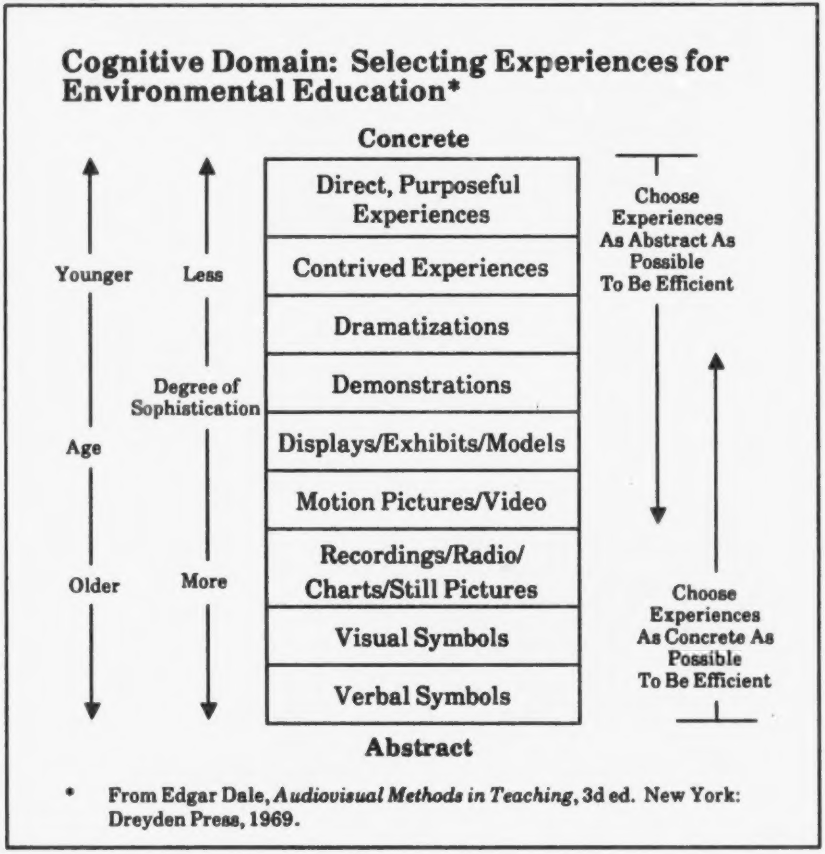
Applying the results of research by Piaget, Arlin, and others (see Part 1) suggests the following guidelines for selecting educational objectives with the cognitive domain.

- All of the identified approaches are related in some way to the age of the learner. A young child will learn a great deal through experiences which are more concrete in nature. Senior high students can learn effectively through more abstract experiences. This does not mean that these students should be offered only those types of experiences at the abstract end of the array. They should also be provided with numerous direct, purposeful experiences.
- Abstract experiences appear to be more efficient because content can be compressed into less teaching and learning time. Teachers should not make the mistake of choosing abstract experiences in order to expedite covering material.
- The individual and collective characteristics of the learners involved, the characteristics of the subject area, and the characteristics of the tasks inherent in learning the subject matter content should be considered in choosing the type of educational opportunity to be offered learners.

In general, experiences should be selected which are as concrete as possible to be effective in achieving an objective and as abstract as possible to be efficient in terms of available resources. Figure 3 summarizes the process of selecting experiences when teaching for objectives which are cognitive in nature.

I have five senses
you must reach
if I'm to learn
and you're to teach.
With taste, touch, smell,
and sight so clear,
why must I receive all
sense by ear?
– C. Harold Fabler

Figure 3



Cognitive Domain: Selecting Experiences for Environmental Education*

Concrete
Direct, Purposeful Experiences
Contrived Experiences
Dramatizations
Demonstrations
Displays/Exhibits/Models
Motion Pictures/Video
Recordings/Radio/ Charts/Still Pictures
Visual Symbols
Verbal Symbols
Abstract
Younger
Age
Older
Less
Degree of Sophistication
More
Choose Experiences As Abstract As Possible To Be Efficient
Choose Experiences As Concrete As Possible To Be Efficient

* From Edgar Dale, *Audiovisual Methods in Teaching*, 3d ed. New York: Dreyden Press, 1969.

Selecting Approaches for Education in the Affective Domain

Earlier in this guide an environmental education objective category dealing with attitudes was discussed. There are really two kinds of objectives within this category: those dealing with *formulating* and those dealing with *refining* attitudes. Younger children probably will be involved more frequently in attitude *formulation* experiences while older children will probably be involved more frequently in attitudinal *refinement* experiences.

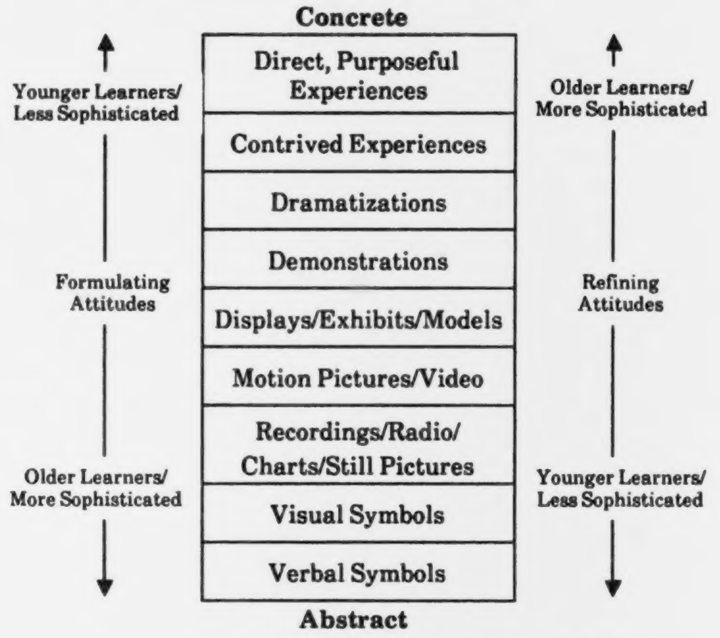
Applying the results of research by Piaget, Arlin, Kohlberg, and others (see Part 1) when selecting educational objectives within the affective domain suggests the following guidelines.

- The approach selected depends on the age and sophistication level of the students and whether the task is that of *formulating* or *refining* attitudes.
- To *formulate* attitudes in older students or to *refine* attitudes in younger students, almost any kind of approach might be effective, but abstract approaches will probably be most efficient.
- To *refine* attitudes in older students, or to *formulate* attitudes in young students, the enriched messages represented by more concrete approaches will probably be more effective.
- An approach necessary to cause attitude *refinement* may not be the same as that needed to achieve a closely related cognitive objective, even though the cognitive objective is essential to the attitudinal refinement.

Figure 4 illustrates these ideas.

Figure 4

Affective Domain: Selecting Experience for Environmental Educaction*


Concrete
Younger Learners/ Less Sophisticated
Formulating Attitudes
Older Learners/ More Sophisticated
Direct, Purposeful Experiences
Contrived Experiences
Dramatizations
Demonstrations
Displays/Exhibits/Models
Motion Pictures/Video
Recordings/Radio/ Charts/Still Pictures
Visual Symbols
Verbal Symbols
Older Learners/ More Sophisticated
Refining Attitudes
Younger Learners/ Less Sophisticated
Abstract

* From Edgar Dale, *Audiovisual Methods in Teaching*, 3d ed. New York: Dreyden Press, 1969.

Additional Comments

In section 1 of the guide, "Grade Level Emphases," it was stated that the fulfillment of human growth needs of students should never be subordinated to the fulfillment of societal needs or the demands of disciplines. If this principle were followed by every teacher in every instance and supported by society, there would be very few educational problems. Joseph R. Kelly and Edwin P. White applied this principle in developing a set of recommendations for selecting teaching/learning activities in environmental education. Their statement, "Characteristics of Children and Their Implications for Environmental Education," appears in Appendix D. It is recommended that the user of this curriculum planning guide study the appendix before trying to develop environmental education activities.

Another author and environmental educator, Noel McInnis, has also written on approaches to teaching and learning. In his book, *You Are an*

Environment: Teaching/Learning Environmental Attitudes (1972; no longer in print) he describes how education sometimes is a process of "learning to become impossible."

> Take an average human child, and subject that child to 13 years of daily prolonged exposure to an environment which does the following:
> - confines the child's body to a very limited territory,
> - confines the child's energy to very limited activity,
> - confines the child's senses to very limited stimulation,
> - confines the child's sociability to very limited interaction with the child's peers,
> - confines the child's mind to very limited experience of and with the world around the child,
> - separates learning from living and doing,
> - subordinates the child's initiative to that of others,
> - assumes the child's ignorance,
> - emphasizes the child's mistakes, and
> - disregards the child's feelings.
>
> What do you get?

Love—Trust
Explore—Joy
Invent—Feel
Share—Care
Learn—Touch
Grow—Become
-American Geological Society poster

But, McInnis notes educational research indicates that certain generalizations can be made about human beings. They

- have a natural desire and potential to learn,
- learn best when the object or subject of their learning is perceived as contributing to their own needs and objectives,
- learn best in situations where self-esteem is not threatened,
- learn best by doing,
- learn best when both their feelings and their intellect are involved in the learning process,
- learn best when they contribute to their self- evaluation, and
- learn best when they have learned how to learn on their own initiative.

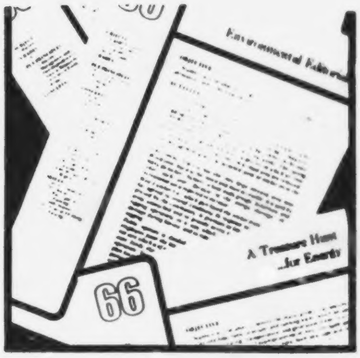
Thus, education need not be a process of "learning to become impossible." Rather, it can become the opposite if activities are selected with consideration of what is known about the way children grow and develop.

5

Introduction

In the introductory section "How to Use This Guide," it was recommended that school districts not produce an environmental education curriculum guide but rather that environmental topics be infused into the curricula. This recommendation, if followed by all teachers in a school district, would result in a totally *environmentalized* school district program of studies. In such a program, the instructional objectives identified for each subject area at each grade level and within each unit of study could still be achieved. Very little, if any, additional instructional time would be required to deal with the added environmental content. New, stimulating approaches to studying subject matter would enhance the entire program.

Developing a Scope and Sequence



The companion environmental curriculum development mongraphs constitute one source of topics to be considered for infusion. Another source might be some of the excellent starter environmental education programs that have been developed in recent years (see Appendix F). Both provide curriculum frameworks which will facilitate the development of a scope and sequence.

A scope and sequence assigns the responsibility for teaching specific portions of content to specific grade levels. In each of the environmental curriculum development monographs, a curriculum framework matrix provides not only a conceptual structure but also identifies at which of four levels—K-3, 3-6, 6-9, 9-12—elements of the structure should be introduced, reinforced, developed further, and applied. This matrix is a starting point for developing a K-12, grade by grade, scope and sequence for the monograph topic.

If one or more of the starter environmental education programs is selected as a source of topics, the scope and sequence should be developed by using the available curriculum framework and suggested grade level assignments for the program's activities. It should be noted, however, that these programs were not necessarily developed with the same objective categories and recommended grade level emphases found in this publication. It will probably be necessary to identify additional content and approaches to teaching and learning to develop a complete scope and sequence.

As suggested in the next part of this guide, a school district environmental education committee or the teaching staff should compare the environmental scope and sequence to the scope and sequences of each subject area in order to identify when and where infusion of the environmental topics is possible.

The Infusion Process

A process for completing the infusion can be described in eight steps.

Step 1. Select the environmental topic to be infused into an existing subject area instructional unit.

Selection criteria include

- the educational experience and the abilities of the students involved;
- the pertinence of the topic to the lives of the students and other citizens of the school district;
- the teacher's own interest, motivation and background;
- the nature of the subject area into which the topic will be infused.

It would be appropriate, particularly with older students, to provide a list of potential topics to the students for them to indicate their interests. The teacher can then select the topics which are most easily infused into the subject area unit.

Example 3 (page 53) illustrates the infusion procedure. The environmental topic selected for study is that of local land use planning.

> *The environmental bandwagon now complicates matters by fostering concern without awareness . . . . Teachers boarding the bandwagon to keep their classes current run the risk of building aimless concern, even distress, in the absence of any contact with the environmental problems right under their noses.*
>
> *– Mark Terry*

Step 2. Identify the subject area units which relate to, or support the investigation of, the selected environment topic. Many units of study within subject areas will readily lend themselves to the selected topic. Once these relationships are established, it is possible to schedule the infusion of the environmental topic into the instructional unit.

As the sample unit indicates, land use planning is to be infused into a unit on civic responsibility within a 9th grade course introducing the social sciences and citizenship.

Step 3. Develop one or more environmental objectives for the subject matter unit.

In the sample, a single objective related to the rights of individuals versus the rights of the entire community has been selected. The existing unit objectives and the added environmental objective are very compatible. The added objective becomes a vehicle to achieving the existing unit objectives.

ENVIRON-
MENTAL
AGENDA
- MINING
- WETLANDS
- NUCLEAR
SAFETY

Step 4. Specify the environmental content to be added to the unit.

The concepts and generalizations related to the objectives of the existing subject area unit will be augmented with concepts and generalizations related to the new environmental objective.

As example 3 indicates, the new content regarding land use would deal with community economic growth and development, the concept of land as a resource, and effective management of resource.

Step 5. Develop new instructional procedures as needed.

Existing unit instructional procedures may satisfactorily achieve the added environmental objectives, but it may be necessary to modify them or adopt additional procedures. In the sample infused unit, a field trip to the site of the controversy is suggested. Interviews are used with the existing unit, but in the modified unit they might be with a different group of people. The use of a simulation in which students role play government officials, realtors, builders, environmentalists, and farmers may be a new approach which can contribute to the achievement of both the environmental objective and existing unit objectives. It may be possible to achieve some of the existing objectives with these new approaches.

> *You can teach* with *your students*, with *your knowledge, and* with *your environments . . . . On the other hand, you can take the subject of ecology and teach your students* about *your knowledge* about *your environments. In the first example you are educating environmentally. In the second case you are perpetuating the gross error which underlies our current environmental predicaments.*
> –*Noel McInnis*

Step 6. Identify new process skills which might be used or developed in achieving the new environmental objectives. The existing unit provided for development of student skills in interviewing, conducting surveys, discriminating between hearsay and factual evidence, and letter-writing. Achievement of the new environmental objectives might develop or refine the following skills.

- Defining key terms and phrases
- Collecting baseline data
- Investigating probable causes
- Contrasting opposing viewpoints on issues
- Setting priorities for resource uses and development plans
- Formulating conclusions based on data gathered
- Hypothesizing causes of conflict
- Proposing compromises between areas of conflict
- Evaluating information, opinions, results
- Relating problems to causes
- Implementing solutions based upon collected data
- Assessing community and societal needs
- Classifying data
- Predicting future effects of actions

Step 7. Identify new resources to be used in developing the environmental objectives. Such resources as equipment, consumable materials, reference books, pamphlets, field trip sites, films, and people could contribute to the study of the new content as well as to the achievement of the existing unit objectives.

In the sample unit, both printed and people resources dealing with land use policy and decision making have been identified.

Step 8. Identify related activities and new topics for investigation which may be suggested by teaching the newly infused unit.

In completing the infusion process, new activities and topics for investigation might be anticipated, but they may also be suggested as the unit is taught. These activities may be directly or tangentially related to the unit.

■ Example 3

A Sample Infused Unit

Citizen Involvement in Land Use Decisions

Process Steps	Existing Unit Characteristics	Added Environmental Elements
1. Select environmental topic to be infused.		Land Use Planning – Specific Local Example
2. Identify subject area units targeted for infusion.	Grade 9: Introduction to the social sciences and citizenship, unit on *Civic Responsibility*	
3. Develop environmental objectives for the subject matter unit.	1. To categorize the rights and responsibilities of citizens in relation to the organization and function of government 2. To understand the nature of community services provided by governments	To determine the responsibility of government in weighing the rights of private ownership against the welfare of the community regarding land use and the environmental effects of such use
4. Specify the environmental content to be added to the unit.	Governments have been organized to perform services for which people have a common need.	Concepts related to economic development, land as a resource, and land use
5. Develop new instructional procedures if they are needed.	Those normally adopted in the development of a unit of this type, especially those which emphasize the role of citizens in community decision making	1. Field trip to site of land use issue 2. Interviews with government officials and real estate developers 3. Class assignment to develop an alternative list of uses of land 4. Simulation of a model community in which various roles are played in making land use decisions
6. Identify new process skills to be developed.	1. Interviewing 2. Surveying community opinion 3. Discriminating between hearsay and factual evidence 4. Letter writing to government officials	1. Predicting futures 2. Establishing priorities (plus all those to left)
7. Identify new resources.	Textbook, reference material	1. Selected materials of land use policy and decision making 2. Resource people from government and business/industry
8. Identify related activities and suggested new topics for investigation	Those suggested by textbook, reference material, and teacher experience	1. How would employment be affected if the planned development was implemented? If it were not? 2. How would the benefits of an alternate use of the land compare to those of the proposed use? 3. Would alternate use benefits offset the social costs of unemployment (presumed to be temporary)?

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A *continuous* program of educational experiences is needed for the development of attitudes, values, and, eventually, a global environmental ethic which can serve as the basis for positive action for environmental quality. Thus, it follows that a districtwide environmental education program be planned and implemented.

District Environmental Education Program Committee

The first step to be taken in developing a program is to form a districtwide environmental education program committee. The membership of this committee should be chosen to insure that all groups affected by the developing program will be involved in decision making. Ideally, committee membership should include: administrators; teachers representing grades K-3, 3-6, 6-9, and 9-12; teachers representing most subject areas but especially science, social studies, health, art, and the language arts; and, if possible, school board members, students, and citizens representing environmental protection agencies, organizations, businesses and industries.

> *What makes education environmental is the way it is experienced. If education is not experienced environmentally, then it is not environmental.*
> *– Noel McInnis*

A person with both leadership ability and a thorough understanding of the environment and environmental education should chair the committee. There is a tendency among educators to equate environmental education with science and to identify science teachers as environmental education leaders. Since the goal of environmental education programs is to develop citizens prepared and motivated to act on behalf of the environment, staff members representing other subject areas, especially the social studies, may be especially qualified for this role. In large school districts, the chairperson's role may be of a full-time position. In medium-sized and smaller districts, partial release time might be scheduled in order to carry out assigned responsibilities.

Committee Preparation

Members of the committee need to fully understand what is contained in this guide, thoroughly discussing and studying it. Consultant help from the Department of Public Instruction, the Department of Natural Resources, or a college or university would be useful in developing this understanding.

Once the members of the committee have reached a satisfactory level of understanding of the guide's contents, they can begin identifying and scheduling the tasks to be completed.

Philosophy, Goals, and Objectives Statements

The committee should develop a school district environmental education philosophy statement which reflects the district's overall educational philosophy (see the philosophical statement in section 1 of this guide). The statement of philosophy should be approved by the school board and administration.

The committee might also develop an official school board policy statement on environmental education which could be submitted along with the philosophy statement (see example on page 58).

Once a statement of philosophy has been developed, a statement of goals and objectives should be developed. The goals statement should relate directly to the newly developed environmental education philosophy (see example on page 58).

Two kinds of objectives need to be identified. *Program objectives* should deal with the major tasks that must be accomplished in order to firmly establish the program. They might deal with the assessment of the current program, development of the scope and sequence, staff preparation, and equipment and material acquisition. *Instructional objective categories*, perhaps patterned after those in section 1 of this guide, also need to be developed.

Assessment

In order to know what steps must be taken to develop a program capable of achieving the identified goals and objectives, a determination of what already is taking place should be made. A survey instrument based on the philosophy and goal statements should be developed in order to collect the necessary data. Such a procedure helps to identify existing strengths and weaknesses.

Example 4

Policy on Environmental Education

The school board recognizes that the quality of life for the inhabitants of planet Earth is directly related to the quality of the environment. Furthermore, the school board recognizes that the actions of the citizens of planet Earth determine environmental quality, and that education can and must foster positive patterns of citizen conduct toward the environment.

Therefore, the school board directs that education about the environment be incorporated into the curriculum and instructional activities of all subject areas at all grade levels in accordance with the program developed by the school district Environmental Education Committee. This program shall:

- consider all aspects of the environment—natural and built, technological, social, economic, political, cultural, and aesthetic—and acknowledge their interdependence;
- offer students experiences as concrete and direct as possible in developing environmental awareness, knowledge, attitudes, and problem-solving skills; and
- involve students in an active problem-solving process in which they investigate the environmental issues and problems of this community in a neutral atmosphere with no position being advanced over another.

The administration shall assist and support the teaching staff in developing and coordinating activities relevant to the above program and make available resources required for its full implementation. The Environmental Education Committee shall prepare an annual report of past and planned programs and activities by October 1 for school board review and acceptance at its October meeting.

Scope and Sequences

The development of scope and sequences for environmental topics (see section 5) is another responsibility of the district environmental education committee. It is important that this task be completed before the infusion of topics begins and be discussed and shared with the staff to prepare them to carry out the infusion process.

Staff Preparation

The actual infusion of environmental topics into existing curricula should be done by as many of the teaching staff as possible. Those who participate in such an activity will generally be more willing to accept and utilize the parts of the curriculum which they have modified.

At a minimum, staff members who are not members of the environmental education committee should be helped to understand the philosophy statement, the goals and objectives statement, the elements of the scope and sequence with which they will work, and the infusion process.

Most members will need additional preparation in environmental education content and methodology. The Wisconsin Administrative Code PI 3.05(4) identifies seven competencies that must be demonstrated by those persons seeking certification to teach in the areas of early childhood, elementary, agriculture, science, and social studies education. Four of these competencies are content-oriented, three deal with methodology.

- Natural resources and their conservation
- Ecological concepts and principles
- Energy in physical and biological systems
- People–environment interactions including
  - —a historical review,
  - —human population growth issues and problems,
  - —resource management,
  - —environmental impacts of technology, and
  - —environmental impacts on physical and mental health.
- The application of affective education methods to environmental education curriculum and instruction
- The ability to infuse environmental topics into a subject area utilizing a variety of instructional techniques
- The ability to teach about citizen involvement in environmental issue and problem resolution

Staff members who have deficiencies in these areas would benefit greatly from workshops or university courses in these areas. The district environmental education program committee should assess the need for staff training and arrange needed workshops or courses.

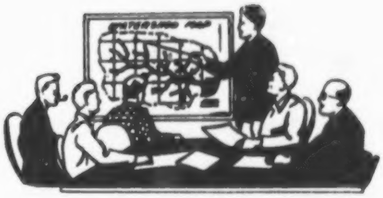
EE is . . . aimed at producing citizens who are environmentally effective . . . knowledgeable concerning the environment and its degradation . . .; skilled in . . . techniques of environmental improvement; and motivated to employ these techniques in a lifelong pursuit of environmental quality for all living things.
– Clay Schoenfeld

Infusing Environmental Content

Once the staff has been prepared, the actual task of infusing environmental content can begin in earnest. The district environmental education committee should assist in this activity as needed.

Environmental education should permeate the entire curriculum with every subject area at every grade level dealing with the environment in some way. Some subject areas, by their very nature, present greater opportunities for the infusion of environmental education, but all have a role to play.

Suggestions regarding potential subject area roles follow.



Agriculture. Agriculture education provides an excellent opportunity to teach about a number of very serious environmental issues and problems, including groundwater contamination from agriculture chemicals, accelerated soil erosion, threatened and endangered plant and wildlife species, energy shortages, and soil and water conservation. Many opportunities are available for students to have direct experiences in dealing with these problems.

Art. Art education curriculum guides published by the Department of Public Instruction during the past fifteen years have emphasized the role of art in developing an aesthetic awareness and sensitivity to both natural and built environments. One publication in particular, *Aesthetics and Environmental Education* (Bull. No. 5500), emphasizes the nature of aesthetics, environmental ethics, aesthetics and the natural environment, aesthetics in land use planning, and urban environmental aesthetics. Art programs should incorporate elements of both natural and built environments into learning experiences offered to students. Both aesthetic elements such as those listed above and the role of art as a means of communicating environmental messages to others should be included.

Foreign Language. Programs in foreign language provide an excellent opportunity to develop a global orientation to studies about the environment. When dealing with the native country and the culture of its people, the class can also examine how the country's inhabitants feel about and deal with environmental issues. This is particularly true at advanced levels when current publications in a country's language might be used as source material. Examples of current environmental issues in other countries which might be used are the French position on nuclear energy and the damage to German forests attributed to acid rain.

Health Education. Health education is one of the most important subject areas in which to deal with various aspects of the environment. Both physical and mental health are dependent upon high quality natural and built environments. Such topics as hazardous chemicals in the home and the workplace, air and water pollution, the need for healthy recreation activities in both indoor and outdoor settings, and the relationship between noise and health are important to consider when planning a health education curriculum. The importance of environmental health was recognized when it was made one of the components of the health education graduation requirement. Aspects of environmental health should be included at the elementary and middle school levels of the health education curriculum as well.

Home Economics. The home economics curriculum affords an opportunity to examine such environmental problems and issues as energy use and conservation, excess packaging and solid waste disposal, recycling, chemical food additives, hazardous chemicals in the home, and other lifestyle related topics. As with other programs which are offered primarily in middle and senior high schools, home economics programs could make a major contribution to the achievement of skill and participation objectives discussed in section 1 of this publication.

Industrial Education. Energy, its use and conservation, has become an important aspect of many programs in this subject. Other issues and problems which might be considered are metals and other materials as natural resources, the use and disposal of hazardous chemical substances, and aesthetics in the design of structures within a community or environment.

Language Arts. All aspects of the language arts have an important role to play in environmental education. Many elements of environments, natural and built, serve as excellent topics for creative writing. The kinds of environmental awareness activities recommended for very young children are excellent for assessing and developing background knowledge for reading. Dramatics activities provide a means of reinforcing environmental concepts learned through other types of experiences. Older students learning to prepare and deliver speeches might study and testify on issues at public hearings. They also might maintain journals and write reports of their findings, successes, and failures. Many environmental books such as *Sand County Almanac* by Aldo Leopold and *Walden* by Henry David Thoreau, provide examples of different writing styles. Two major K-12 environmental education curriculum programs, *Project Learning Tree* and *Project Wild*, use the language arts extensively in teaching about the environment. Both indoor and outdoor, natural and built environments are used. All of the language arts could be addressed through an environmental topic developed as a thematic unit.

Mathematics. The resolution of environmental issues often is dependent on the collection and analysis of data, and the communication of results through charts and graphs. Thus, mathematics becomes an important tool to those involved in the resolution of such issues. Many mathematics concepts can be made more understandable if experiences and examples from natural and built environments are used in teaching and learning about them. Geometric shapes and patterns of all kinds—circles, ellipses, rectangles, spheres, cylinders, cubes, and spirals—are found throughout both natural and built environments.

Physical Education. The development of lifetime skills has become an important part of the physical education curriculum in recent years. Included in this emphasis are canoeing, backpacking, camping, fishing, and other outdoor activities. Physical education programs have become a means to deal with topics like outdoor ethics, the pros and cons of hunting, consumptive versus nonconsumptive outdoor activities, and the relationship of a quality environment to physical and mental health.

Science. The study of science presents numerous opportunities to deal with environmental topics at almost any grade level. An important part of environmental education *content* is a major part of the sciences, but to equate environmental education and science is erroneous. The goal of environmental education is to prepare citizens capable of acting on behalf of the environment. An understanding of certain aspects of science is an important part of the qualifications for effective citizen action as indicated in section 2, Environmental Education Content: Fundamental Principles.

Two other components of science education are very important to environmental education programs: the emphasis on the development of problem-solving skills and the study of the relationships among science, technology, and society. Science education makes an important contribution to achieving the skill and participation objectives of environmental education.

Social Studies. The social studies have a responsibility for environmental education equal to that of the sciences. The goal of environmental education is to prepare citizens capable of acting on behalf of the environment. Since policy decisions on the local, state, national, and global levels are tied to human political and economic systems as well as the value positions held by people, it is within the realm of the social studies to describe, analyze, and study alternative actions and behaviors relative to the health of the environment.

Other Subject Areas. Subject areas not included in the preceding discussion also have roles to play. All subject areas can and should be concerned with the conservation of natural resources and contamination of the environment.

Many of the Department of Public Instruction's subject guides to curriculum planning included in this series contain a discussion of approaches to environmental education and should be consulted.

It is difficult to recommend any kind of schedule for environmental education. If a district environmental education committee develops scope and sequences, using one or more of the environmental education curriculum development monographs or one or more environmental education starter programs and matches it against existing subject area scope and sequences, the amount of infusion suggested will probably vary greatly between grade levels and subject areas. No specific time allocations will be recommended but the subject areas which should bear the major responsibility for teaching about the environment are art, language arts, health, science, and the social studies. A substantial portion of the curriculum and of instructional time in these subject areas should be identifiable as environmental education.

Materials and Equipment

Part of the infusion process includes developing student activities for which materials and equipment may have to be procured. Material and equipment needs should be accumulated in lists for use in developing budget requests. Field trip possibilities should also be identified and budgeted. It is essential that the necessary materials and equipment be acquired prior to the classroom field tests.

Facilities and Community Resources

Environmental education does not generally require major renovation of classrooms or other building facilities, but since many environmental education activities take place outside the classroom, it may be appropriate to develop sites where these activities are to take place. These extra-classroom facilities include school campuses, outdoor laboratories (such as school forests and marshes), parks, and private land. The planning for and development of such sites is a major *educational* activity in itself and should involve teaching and administrative staff, students, and community representatives. Several sources of information on site development are listed in Appendix E.

It is also extremely important to identify community resources. Included in such a list of resources might be the local water purification plant, sewage disposal plant, sanitary landfill, incinerator, local businesses and industries, governmental agencies, organizations, nature centers, and people who might contribute to the program. A directory of these resources should be developed and updated annually to include the name, address, and telephone number of the contact person.

Evaluation

Evaluation is a fundamental and continuing aspect of effective environmental education programs.

Evaluation should begin with field testing of infused units. The district environmental education committee, particularly its chairperson, should monitor this process and assist as needed. Program changes suggested as a result of this monitoring process should be made as quickly as possible.

The goal of evaluation is the improvement of the teaching/learning process. Two keys to outstanding teaching are *effectiveness* and *efficiency*. *Effectiveness* means the results are worthwhile, for example, that students have achieved proficiency in thinking about environmental issues. *Efficiency* means that the methods used are the best in terms of cost and time required. Evaluation, then, is judging the value of the environmental education program—its products, ends, or results (*effectiveness*) and its processes, means, or ways of carrying out the program (*efficiency*).

Benefits to be derived from evaluation may be best categorized under four headings.

Far too little consideration has been given to how program efforts have resulted in behaviors which promote wise use of resources, which encourage conservation, or which actually improve the environment.
– Ronald B. Childress
– Jonathan Wert

Program Improvement. This involves improvements in teaching methods and learning activities, the classroom and extra-classroom learning environment, and instructional resources.

Growth in Student Learning. This includes the acquisition of knowledge, the study of values and ethical reasoning, and the improvement of thinking and action skills. Evaluation helps by identifying student learning needs and measuring student achievements.

Environmental Improvement. This can be a direct process, such as planning and implementing the plan for an outdoor laboratory on a school site, or an indirect process, such as communicating a concern about an environmental problem to an official or body that can act directly upon it.

Increased Program Support. Program evaluation strongly suggests that staff members care about students, the teaching profession, and the environment. The futuristic orientation of environmental education, coupled with these factors, can be a powerful public relations factor which generates the respect and support of other staff members and the general public.

It is essential that students be involved in the evaluation of the environmental education program because of their close association with the program and because it contributes to the development of independent critical thinking on their part. They should be involved from the beginning in the planning of the evaluation exercise as well as in its implementation.

Providing time for evaluation is probably the greatest obstacle that will be encountered. The solution is to build it into the program at the very beginning and to limit evaluation to what is most important.

The recommended procedure for evaluation consists of four steps.

- Decide what to evaluate
- Plan how to do it
- Carry out the evaluation
- Use the results.

Curriculum development is a continuing activity. A standing environmental education committee will be able to use the results of the monitoring and evaluation activities to suggest program revisions. As stated in the suggested school board policy on page 58, an annual report covering the past year's program and plans for the coming year should be prepared and submitted.

7

Ecological, Conservation, Outdoor, and Environmental Education

Ecology and environment are often mistakenly used interchangeably. Ecology is a biological science in which the relationships of living organisms with each other and with their environment are studied. The environment is the aggregate of external conditions that influence the life of an individual organism or population. Ecology and environment are not the same thing, nor is education about them.

Conservation education is classically regarded as dealing with education about natural resources such as forests, minerals, soil, water, and wildlife, and the wise use management of these resources. Solutions to problems are rather specific, such as contour strip-cropping to reduce soil erosion. Environmental education has a much broader perspective, considering the total environment and focusing on the relationship between human values and environmental issues of all types. Instead of relying on specific solutions to problems, environmental education teaches the use of alternative solutions and an analysis of subsequent outcomes. Preservation of a resource may be one of these alternative solutions. Conservation education is neither bad nor archaic; it constitutes a substantive part of the structure of environmental education.

Outdoor education is a valuable *method* of instruction which contributes substantially to the teaching strategies of environmental education. The traditional subject matter of outdoor education programs constitutes only a part of a complete environmental education program. The latter utilizes numerous indoor as well as outdoor activities and draws heavily on both natural and built environments in trying to prepare citizens who are capable of and motivated to act positively on behalf of environmental quality.

Resident Camping Experiences in Environmental Education

Many Wisconsin school districts provide a resident camping program for students, usually in grade 6. This experience is often regarded as the most important element of an environmental education program. Indeed, many educators seem to equate resident camping and environmental education programs, often referring to them as though they were synonomous.

Resident camping programs make an important, unique contribution to achieving the goals and objectives of environmental education, but they should never be regarded as a school district's total environmental education program.

The objectives and activities of resident camping programs should be part of the environmental education scope and sequences developed by a district environmental education committee. They can be infused into subject area curriculum along with all other environmental topics.

Senior High School Courses

The philosophy of environmental education underlying this guide stresses the infusion of environmental content into all subject areas at all grade levels. Different categories of environmental education objectives were recommended for emphasis at different grade levels. In grades 9-12 these categories were skills, participation, and attitudes.

Some Wisconsin high schools offer students elective courses dealing with the environment, and these should be appropriately offered as part of a K-12 environmental education program. Examples of course titles are Conservation of Natural Resources, Environmental Studies, or Environmental Science. The content of these courses varies greatly and is most frequently related to the interests and preparation of the teacher. It is recommended that the courses

- be elective and offered to students in their junior or senior year;
- not supplant or inhibit the infusion of environmental content into subject area curricula for the junior and senior years;
- stress the kinds of objectives recommended for these grade levels—skills, participation, and attitudes (Awareness and knowledge objectives should not be ignored but should take a secondary role.);
- have a definite issue orientation (The specific issues to be studied should be identified by students and teachers working together. Students should become involved in at least one international, one national, one statewide, and one *local* environmental issue. If the local issue chosen for study is a manifestation of a larger issue, an *additional local* issue should be selected for study.);
- be taught by an interdisciplinary team,(for example, science and social studies teachers);
- use both secondary and primary sources of information in the study of issues.

> *. . . . an environmentally literate citizenry . . . and continued environmental education programs, will make it possible to develop new knowledge and skills, values and attitudes, in a drive toward a better quality of environment, and, indeed, toward a higher quality of life for present and future generations . . . .*
>
> *– William B. Stapp*

Dealing with Controversial Issues

> *Education's function is not to promote any propaganda, not to propound any principle as established and fixed for all time, not to assert that any belief is unchangeable, not to assert that any conclusion may not be mistaken—education's one and overwhelming responsibility is to establish the inquiring habit of mind and a veneration for truth.*
> *- Ernest Martin Hopkins*

Environmental education programs must provide students with opportunities to identify, investigate, and participate in the attempted resolution of environmental issues and problems in their own community. Environmental issues and problems are usually controversial due to significant differences of opinion because of value differences people have. Controversy is inherent in a free democratic society, and educators often have promoted the discussion of controversial issues as being essential to education for citizenship in a free society. More than a discussion of the controversial issues is needed. Students must be *immersed* in the *identification, investigation,* and *resolution* of environmental issues and problems in their own community.

The successful resolution of environmental issues and problems requires proficiency in the following skills.

- communicating effectively, orally and in writing;
- collecting and interpreting information;
- justifying personal decisions and action strategies on controversial issues;
- working cooperatively with other people;
- recognizing relationships between specific events which are part of the issue resolution process and the issue itself on a more general level;
- understanding and using selected citizen actions required to influence decisions on specific issues—persuasion, consumerism, political action, legal action, management—or combinations of these strategies.

In order for students to develop these kinds of skills, teachers must help students

- recognize and clearly state issues;
- identify and evaluate relevant information;
- learn the techniques of analysis, synthesis, evaluation, and application; and
- learn to make independent judgements.

In dealing with most issues, the atmosphere of the classroom must be as neutral as possible. Teachers must be familiar with all sides of issues, stand firm for each advocate's right to be heard, and use the classroom as a stage for rational, informed debate. Teachers should be as *value fair* or *value free* as possible in their roles and resist the temptation to let their own positions on issues be known and thus bias the conclusions reached by students.

Computers

The involvement of students in the investigation and resolution of environmental problems can be greatly enhanced through the use of computers. They lend themselves to a number of aspects of the instructional process. Software is available and constantly being developed which can be used as follows.

Drill and practice programs review and reinforce environmental concepts or skills already taught.

Tutorial programs introduce and explain environmental concepts and facts.

Simulation programs model real world environmental situations which allow students to make decisions and to interact in situations that are often too complex, expensive, dangerous, or distant to be brought into the classroom.

Discovery programs develop cognitive abilities in environmental problem solving.

Instructional gaming programs hold a user's attention and interest while teaching logical thinking or make practice less tedious.

Word processing programs support writing, editing, formatting, and printing all kinds of written documents.

Data base programs allow for the collection, organization, retrieval, sorting, display, and printing of environmental data.

Spreadsheet programs simulate a scientific worksheet where environmental data entered into cells can be calculated automatically.

Telecommunication programs allow for the input, transmission, sorting, receiving, and display of environmental information from various sources.

Computers can contribute significantly to the development and implementation of environmental education programs. They should not, however, replace direct and nearly direct experiences as the principal type of learning activity.

Equity Considerations

Factors such as sex, race, color, ethnicity, and physical and mental abilities are often used to sort, group, and track students into stereotyped patterns that prevent the exploration of all options and opportunities in which individuals may have talent or interest. Such treatment has a significant cost in terms of the individual's academic achievement, psychological and physical development, career choice, and family relationships. Each student should have opportunities to be challenged, to grow and develop, and to achieve identity limited only by his or her talents.

In the development and implementation of environmental education programs and in the selection of materials, six forms of bias should be eliminated.

Invisibility: underrepresentation of certain groups. This leads to the implication that these groups are of less value, importance, and significance.

Stereotyping: assigning traditional and rigid roles or attributes to a group. This limits the abilities and potential of that group and denies students knowledge of the diversity, complexity, and variations of that group.

Imbalance/selectivity: presenting only one interpretation of an issue, situation or group. This distorts reality and ignores complex and differing viewpoints through selective presentation of materials.

Unreality: presenting an unrealistic portrayal of history and of contemporary life experience.

Fragmentation/isolation: separating issues related to minorities and women from the main body of the text.

Linguistic bias: excluding the role and importance of females by constant use of the generic "he" and other sex-biased words.

Wisconsin school districts are urged to actively promote the value of all persons by including the contributions, images, and experiences of all groups in the formulation of environmental education curricular objectives and classroom activities.

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II. Environmental Topics for [illegible]

1. Major Threats to Environmental Quality in North America

Appendix A

The Tbilisi Declaration

The World's First Intergovernmental Conference on Environmental Education, organized by UNESCO in cooperation with the United Nations Environment Programme (UNEP), was convened in Tbilisi, Georgia (USSR), from 14 to 26 October 1977.

Delegates from 66 Member States and observers from two non-Member States participated as well as representatives and observers from eight agencies and programmes of the United Nations system, three other intergovernmental organizations and 20 international nongovernmental organizations. In all 265 delegates and 65 representatives and observers took part in the Conference.

The Conference was opened by Unesco's Director General Amadou-Mahtar M'Bow and welcomed by a message of greeting from Leonid I. Brezhnev, Secretary-General of the Communist Party of the USSR and Chairman of the Presidum of the Supreme Soviet of the USSR. Similarly participants were welcomed by Z.A. Pataridze, Chairman of the Council of Ministers of the Georgian SSR, host of the Tbilisi Conference. UNEP's Executive Director Mostafa K. Tolba then joined Mr. M'Bow in an address to the participants before they began almost two weeks of working sessions.

Adopted by acclamation at the close of the Intergovernmental Conference, the Tbilisi Declaration noted the harmony and consensus which had prevailed and the unanimous accord in the important role of environmental education in the preservation and improvement of the world's environment, as well as in the sound and balanced development of the world's communities.

In the last few decades, man has, through his power to transform his environment, wrought accelerated changes in the balance of nature. The result is frequent exposure of living species to dangers which may prove irreversible.

The Declaration of the United Nations Conference on Human Environment organized in Stockholm in 1972 proclaimed: "to defend and improve the environment for present and future generations has become an imperative goal for mankind." This undertaking urgently calls for new strategies, incorporated into development, which particularly in the developing countries is a prerequisite for any such improvement. Solidarity and equity in the relations between nations should constitute the basis of a new international order, and bring together, as soon as possible, all available resources. Education utilizing the findings of science and technology should play a leading role in creating an awareness and a better understanding of environmental problems. It must foster positive patterns of conduct towards the environment and nations' use of their resources.

Environmental education should be provided for all ages, at all levels and in both formal and nonformal education. The mass media have a great responsibility to make their immense resources available for this educational mission. Environmental specialists, as well as those whose actions and decisions can have a marked effect on the environment, should be provided in the course of their training with the necessary knowledge and skills and be given a full sense of their responsibilities in this respect.

Environmental education, properly understood, should constitute a comprehensive lifelong education, one responsive to changes in a rapidly changing world. It should prepare the individual for life through an understanding of the major problems of the contemporary world, and the provision of skills and attributes needed to play a productive role towards improving life and protecting the environment with due regard given to ethical values. By adopting a holistic approach, rooted in a broad interdisciplinary base, it recreates an overall perspective which acknowledges the fact that natural environment and man-made environment are profoundly interdependent. It helps reveal the enduring continuity which links the acts of today to the consequences for tomorrow. It demonstrates the interdependencies among national communities and the need for solidarity among all mankind.

Environmental education must look outward to the community. It should involve the individual in an active problem-solving process within the context of specific realities, and it should encourage initiative, a sense of responsibility and commitment to build a better tomorrow. By its very nature, environmental education can make a powerful contribution to the renovation of the educational process.

In order to achieve these goals, environmental education requires a number of specific actions to fill the gaps which, despite outstanding endeavors, continue to exist in our present education system.

Accordingly, the Tbilisi Conference:

Appeals to Member States to include in their educational policies measures designed to introduce environmental concerns, activities and contents into their education systems, on the basis of the above objectives and characteristics;

Invites educational authorities to promote and intensify thinking, research and innovation in regard to environmental education;

Urges Member States to collaborate in this field, in particular by exchanging experiences, research findings, documentation and materials and by making their training facilities widely available to teachers and specialists from other countries; and lastly,

Appeals to the international community to give generously of its aid in order to strengthen this collaboration in a field which symbolizes the need for solidarity of all peoples and may be regarded as particularly conducive to the promotion of international understanding and to the cause of peace.

The Role, Objectives and Characteristics of Environmental Education

The Tbilisi Declaration together with two of the recommendations of the Conference constitutes the framework, principles and guidelines for environmental education at all levels—local, national, regional and international—and for all age groups both inside and outside the formal school system.

I. The Conference *recommends* the adoption of certain criteria which will help to guide efforts to develop environmental education at the national, regional and global levels:

- Whereas it is a fact that biological and physical features constitute the natural basis of the human environment, its ethical, social, cultural and economic dimensions also play their part in determining the lines of approach and the instruments whereby people may understand and make better use of natural resources in satisfying their needs.

- Environmental education is the result of the reorientation and dovetailing of different disciplines and educational experiences which facilitate an integrated perception of the problems of the environment, enabling more rational actions capable of meeting social needs to be taken.

- A basic aim of environmental education is to succeed in making individuals and communities understand the complex nature of the natural and the built environments resulting from the interaction of their biological, physical, social,
economic and cultural aspects, and acquire the knowledge, values, attitudes and practicalskills to participate in a responsible and effective way in anticipating and solving environmental problems, and in the management of the quality of the environment.
- A further basic aim of environmental education is clearly to show the economic, political and ecological interdependence of the modern world, in which decisions and actions by different countries can have international repercussions. Environmental education should, in this regard, help to develop a sense of responsibility and solidarity among countries and regions as the foundation for a new international order which will guarantee the conservation and improvement of the environment.
- Special attention should be paid to understanding the complex relations between socio-economic development and the improvement of the environment.
- For this purpose, environmental education should provide the necessary knowledge for interpretation of the complex phenomena that shape the environment, encourage those ethical, economic, and esthetic values which, constituting the basis of self-discipline, will further the development of conduct compatible with the preservation and improvement of the environment. It should also provide a wide range of practical skills required in the devising and application of effective solutions to environmental problems.
- To carry out these tasks, environmental education should bring about a closer link between educational processes and real life, building its activities around the environmental problems that are faced by particular communities and focusing analysis on these by means of an interdisciplinary, comprehensive approach which will permit a proper understanding of environmental problems.
- Environmental education should cater to all ages and socio-professional groups in the population. It should be addressed to (a) the general nonspecialist public of young people and adults whose daily conduct has a decisive influence on the preservation and improvement of the environment; (b) to particular social groups whose professional activities affect the quality of the environment; and (c) to scientists and technicians whose specialized research and work will lay the foundations of knowledge on which education, training, and efficient management of the environment should be based.
- To achieve the effective development of environmental education, full advantage must be taken of all public and private facilities available to society for the education of the population: the formal education system, different forms of nonformal education, and the mass media.
- To make an effective contribution towards improving the environment, educational action must be linked with legislation, policies, measures of control, and the decisions that governments may adopt in relation to the human environment.

II. The Conference *endorses* the following goals, objectives and guiding principles for environmental education:

The *goals* of environmental education are:

- To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;
- To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;
- To create new patterns of behavior of individuals, groups and society as a whole towards the environment.

The categories of environmental education *objectives* are:

Awareness—*to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.*

Knowledge—*to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems.*

Attitudes—*to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.*

Skills—*to help social groups and individuals acquire the skills for identifying and solving environmental problems.*

Participation—*to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.*

Guiding principles—environmental education should

- consider the environment in its totality—natural and built, technological and social (economic, political, cultural-historical, moral, esthetic);
- be a continuous lifelong process, beginning at the preschool level and continuing through all formal and nonformal stages;
- be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;
- examine major environmental issues from local, national, regional, and international points of view so that students receive insights into environmental conditions in other geographical areas;
- focus on current and potential environmental situations while taking into account the historical perspective;
- promote the value and necessity of local, national and international cooperation in the prevention and solution of environmental problems;
- explicitly consider environmental aspects in plans for development and growth;
- enable learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences;
- relate environmental sensitivity, knowledge, problem-solving skills and values clarification to every age, but with special emphasis on environmental sensitivity to the learner's own community in early years;
- help learners discover the symptoms and real causes of environmental problems;

- emphasize the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;
- utilize diverse learning environments and a broad array of educational approaches to teaching, learning about and from the environment with due stress on practical activities and first-hand experience.

Wisconsin Administrative Code PI 3.05(4)

Environmental education. Effective July 1, 1985, adequate preparation in conservation of natural resources is required for a license to teach early childhood, elementary education, agriculture, and for secondary education licenses in science and social studies with the exception of philosophy, psychology, and religious studies. Programs shall provide students with the following knowledge:

(a) Knowledge of the wide variety of natural resources and methods of conserving these natural resources;
(b) Knowledge of interactions between the living and nonliving elements of the natural environment;
(c) Knowledge of the concept of energy and its various transformations in physical and biological systems;
(d) Knowledge of local, national, and global interactions among people and the natural and built environments including:
   1. Historic and philosophical review of the interactions between people and the environment;
   2. The social, economic, and political implications of continued growth of the human population.
   3. The concept of renewable and nonrenewable resources and the principles of resource management;
   4. The impact of technology on the environment; and
   5. The manner in which physical and mental well-being are affected by interaction among people and their environments.
(e) Ability to use affective education methods to examine attitudes and values inherent in environment problems.
(f) Ability to incorporate the study of environmental problems in whatever subjects or grade level programs the recipient of the certificate or license is permitted to teach through the use of the following methodologies:
   1. Outdoor teaching strategies;
   2. Simulation;
   3. Case studies;
   4. Community resource use; and
   5. Environmental issue investigation, evaluation, and action planning.
(g) Knowledge of ways in which citizens can actively participate in the resolution of environmental problems.

Two Hats*

It would appear that environmental educators have a bad case of the "two hat" problem. We have come by the problem naturally and therefore, we have paid little attention to it.

The problem is simply that industry, utilities, labor, business, media and other segments of the population and the general public have consistently recognized only one hat when talking about environmentalists and environmental educators. It is not uncommon for dedicated environmental educators to be summarily dismissed as troublemakers—environmentalists. This one hat view is easily explained because environmental educators are almost always environmentalists. Perhaps definitions will help clarify the problem.

Any world citizen who advocates with greater or lesser action that wrongs against our environment must be stopped is an environmentalist. Perhaps the negative reputation environmentalists have stems from the dramatic and radical actions of a few.

An environmental educator, on the other hand, is any world citizen who uses information and educational processes to help people analyze the merits of the many and varied points of view usually present on a given environmental issue. The environmental educator is not the "mediator," "trade-off specialist" or "negotiator," but a developer of skills and an information analyst who prepares the people (from any segment of the population) who will participate in environmental decision making.

Environmental educators, therefore, need to be as "value fair" or "value free" as they can when working in this role. They must scrupulously strive to get all the facts, examine and illuminate all the viewpoints, and keep from letting their own particular position (as an environmentalist) from mixing with their educator role.

My suggestion is simply that environmental educators make an effort to clarify the two distinct roles. At every opportunity, we should emphasize the neutral nature of environmental education activity. Strong advocacies are all around us, each using the techniques of persuasion and propaganda to build their constituencies. We must ourselves be familiar with all sides, stand firm for each advocate's right to be heard and provide a rational stage for informed debate.

Environmental educators have the right and the duty to be environmentalists, but the dual roles must adhere to the original premise—to keep each hat on its proper head, while utilizing to the fullest the professional skills of the environmental educators.

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* John Hug. Reprinted from *A Report on the North American Regional Seminar on Environmental Educator: A Confrontation with the Issues: Environmental Education for the Real World.* Columbus, OH: SMEAC Information Center, 1977 See Aldrich 1977.

Characteristics of Children and Their Implications for Environmental Education*

Children in the lower elementary grades:	Implications for environmental education:
1. ...are curious and employ all their senses in exploring their surroundings.	1. Activities should promote touching, hearing, seeing, and smelling as ways for gathering information about their environments.
2. ...bring to school a wide variety of cognitive abilities.	2. Activities should be developed which offer children of differing cognitive abilities the opportunity to participate and succeed.
3. ...are limited in their ability to interpret time, space, and distance.	3. Activities should minimize time, space, and distance aspects of the environment.
4. ...have difficulty in realizing that objects have several properties.	4. Activities should emphasize objects with a relatively small number of properties.
5. ...have difficulty thinking logically.	5. Activities requiring logical development of relationships should be minimized, particularly in the early grades.
6. ...begin reasoning simple cause and effect relationships.	6. Activities should promote the examination of simple cause and effect relationships in the environment.
7. ...like immediate results and lose interest in prolonged experiences.	7. Activities should be varied, brief, and scaled to the attention span of the children.
8. ...seek out identification and clarification of their individual roles as people.	8. Activities should include experiences aimed at answering the question, "Who am I?" in relation to their environment.
9. ...are limited in the complexity and variety of their communication skills.	9. Activities should assist children in expanding and strengthening their use of verbal and non-verbal communication skills.
10. ...are capable of recognizing the mood of a speaker as factual, serious, or humorous.	10. This suggests the importance of the teacher's interest, sincerity, and concern while speaking with the children about the environment.
11. ...enjoy pictures and read their own experience into them as they talk about what they see.	11. Careful selection of pictures by the teacher can promote interest in the environment and foster the consideration of simple relationships.
12. ...enjoy using various art forms and media as means of expressing their ideas and feelings.	12. The children's use of art forms and media can provide valuable information concerning the children's knowledge of, and attitudes toward, their environment.

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* Based on a statement in *Environmental Education Guide K-12*, State Department of Education, Richmond, Virginia, July 1974. A similar statement may be found in Kelly, Joseph R. and Edwin P. White. "A Developmental Framework For Planning Environmental Education Programs." *Science and Children*, (April 1975).

13. ...enjoy sharing their experiences with others in their class.	13. Discussion and guided questioning by the teacher may promote understanding of environmental phenomena as they relate to the children's experience.
14. ...enjoy listening to stories read to them.	14. By carefully selecting stories to be read, teachers can help children become interested in various aspects of their environment.
15. ...enjoy collecting objects from nature and technology.	15. Interests revealed by the children's collections may serve as a focus for planned environmental experiences.
16. ...have limited psychomotor coordination, dexterity, and stamina.	16. Activities should be selected which do not make unrealistic demands on the children's psychomotor capabilities and endurance.
17. ...possess a rudimentary moral sense based on highly personal concepts of right and wrong.	17. Activities should be chosen which avoid complex value dilemmas related to externally-based moral systems.

Children in the middle elementary grades begin to:	**Implications for environmental education:**
1. ...have difficulty initially in isolating variables and often proceed from step to step in thinking without relating each link to all others.	1. Early in this period, activities should involve small numbers of variables and minimal emphasis on logical relationships.
2. ...distinguish between observations and inferences.	2. Activities should promote the distinction between observing and inferring and the logical basis for the process of inferring.
3. ...distinguish between fact and opinion.	3. Activities should promote the distinction between fact and opinion and their relative worth as a basis for decision-making.
4. ...develop special interests and hobbies.	4. Activities should offer children the opportunity to pursue their individual interests.
5. ...understand the relationship between cause and effect.	5. Activities should present situations in which cause-effect relationships may be examined.
6. ...have increased and refined psychomotor skills.	6. Activities may be developed which require increased psychomotor coordination.
7. ...show increasing concern for the authenticity of materials which they read.	7. With the teacher's assistance, children may be helped to question the authenticity of readings about the environment.
8. ...detect more subtle forms of a speaker's intent: informative, persuasive, evasive.	8. The degree of interest, enthusiasm, and commitment which the teacher possesses in relation to environmental issues becomes increasingly evident to the children.

9. ...become increasingly involved as a personal commitment is made.	9. Activities should stress an action orientation that will result in a stronger commitment to the improvement of the children's environment.
10. ...become more capable and desirous of involvement in making decisions.	10. Activities should involve children in making decisions about themselves and their environment.
11. ...function as part of a group and begin to understand social requirements and social responsibility.	11. Activities should foster group experiences and promote the idea that the actions of individuals affect groups and that the individual has a responsibility to the group.
12. ...relate vicariously to people and places through literature.	12. Learning about other environments through use of carefully selected literature may help children examine their own environments more critically.
13. ...develop moral reasoning based on viewing life from other points of view than their own.	13. Activities can provide opportunities for making moral decisions on a basis rather than what is right or wrong for one as an individual.

Children in the upper elementary grades begin to:	**Implications for environmental education:**
1. ...handle two or more variables with ease and comprehend logical relationships.	1. Activities may deal with several variables and promote the search for logical relationships.
2. ...make predictions based on past experiences.	2. Activities may be developed which emphasize predicting.
3. ...develop the capability to hypothesize and develop simple tests of hypotheses.	3. Activities should promote the formulation of hypotheses based on data and the development of means for testing them.
4. ...develop the ability to discriminate, clarify, and challenge experiences.	4. Activities should promote the identification of significant factors in a complex environmental setting and promote the clarification of environmental issues.
5. ...see discussion as a way of working toward group decisions and the resolution of issues.	5. Activities may be developed around more complex issues to be resolved through group processes.
6. ...become capable of understanding decision-making processes and the resulting implications of making decisions.	6. Activities should provide opportunities for children to make decisions and be responsible for the resulting consequences.
7. ...need the opportunity to assume responsibility in order to learn the relationship between choice and responsibility.	7. Activities should promote choice and decision-making in a context of responsible action.
8. ...feel an emotional attachment toward their country and begin developing enduring patriotism.	8. Activities may be developed to encourage feelings of responsibility by the individual toward the betterment of his or her country.

9.	...examine and question established belief systems.	9.	Activities may be developed which raise questions about belief systems and allow the examination of the foundational beliefs on which such systems are based.
10.	...comprehend moral reasoning based on what is best for society, the greatest number, or the social order.	10.	Activities may be developed which promote more complex moral judgments about environmental issues.

Resources for Environmental Education Curriculum Development

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Environmental Education Starter Programs

There are several environmental education programs which have stated objectives fitting within the categories identified in section 1. These have been referred to in this publication as *starter* environmental education programs because they appear to be a good *beginning* to the development of a total environmental education program. However, they are not complete in themselves and must be supported by additional programming, as indicated in the additional comments section of each of the following program descriptions.

Project Learning Tree

Grade Levels Served: K-12

Subject Areas: Art, Government, Health, History, Home Economics, Industrial Education, Language Arts, Mathematics, Music, Physical Education, Science, Social Studies, Vocational Agriculture.

Stated Objectives: (1) To help students develop an awareness and appreciation of the environment; (2) to help students develop an awareness and understanding of the diversity and importance of forest resources; (3) to help students develop an understanding of the impact and role of forests in shaping political, economic, and sociological events of the past, present, and future; (4) to acquaint students with perspectives from which interest groups judge environmental issues, how these issues are resolved, and ways in which their outcome may be influenced; (5) to provide students with knowledge and skills needed to predict and evaluate the impact of management policies on the environment; (6) to provide students with an understanding of how the life support system of Earth works; (7) to help students gain skills and knowledge needed to evaluate and modify their own lifestyles in an effort to maintain and enhance the quality of the environment.

Program Description: A two-volume set of activities organized according to the above objectives. The grades K-6 volume contains 89 activities while the grades 7-12 volume has 88. Many activities have variations or extensions of the basic activity. All activities provide students concrete experiences (dramatizations, contrived experiences, or direct, purposeful experiences). Many activities are conducted out of doors. Equipment and materials used are of low cost and easily obtained.

Sponsor/Producer: American Forest Institute, Inc., and the Western Regional Environmental Education Council.

Additional Comments: (1) The program is an excellent starter program but is not complete in itself. It especially needs additional support in grades 7-12 in achieving skill and participation objectives. An excellent combination of programs would be Project Learning Tree and The CLASS Project. (2) Although it's title implies a concentration on trees, the program actually deals with the total environment. (3) The materials are not for sale. They are available free of charge by attending a workshop lasting five-six hours.

Workshops may be conducted for individual school buildings, school districts, or combinations thereof. A minimum of six participants is required. (4) For further information on this program contact: Project Learning Tree, Environmental Education, Department of Public Instruction, P.O. Box 7841, Madison, WI 53707.

Project WILD

Grade Levels Served: K-12

Subject Areas: Art, Business Education, Career Education, Drama, Geography, Government, Health, History, Home Economics, Language Arts, Mathematics, Music, Physical Education, Reading, Science, Social Studies, Speech, Vocational Agriculture.

Stated Objectives: To help students (1) develop an awareness and appreciation of wildlife; (2) develop an understanding of the value of wildlife to human beings; (3) acquire an understanding of the role of wildlife in ecological systems; (4) understand principles of wildlife conservation; (5) understand relationships between wildlife and human cultures and societies; (6) become acquainted students with current wildlife issues and the consequences of various alternative actions; (7) develop a feeling of personal responsibility for wildlife and the environment.

Program Description: A two-volume set of activities organized according to the above objectives. The volume for grades K-6 contains 81 activities while the volume for grades 7-12 contains 87. However, some activities are useful in a wide range of grade levels and are included in both volumes. Some activities include suggested extensions of the basic activity. Most activities provide students with concrete experiences (dramatizations, contrived experiences, or direct, purposeful experiences). About one-fourth of the activities are conducted out of doors. Equipment and materials used are inexpensive and easily obtained.

Sponsor/Producer: Western Association of Fish and Wildlife Agencies and the Western Regional Environmental Education Council.

Additional Comments: (1) The program is an excellent starter program but is not complete in itself. It needs additional support in grades 7-12 in achieving skill and participation objectives. (2) The program concentrates so directly on wildlife that it may create an impression that these are the only kinds of environmental issues. Additional programming to broaden this perspective to the total environment is needed. (3) The materials are not for sale. They are available free of charge by attending a workshop lasting five-six hours. (4) For further information on this program contact: Project WILD, Department of Natural Resources, P.O. Box 7921, Madison, WI 53707.

The CLASS Project

Grade Levels Served: 6-9, but maybe adapted for use in grades 10-12.

Subject Areas: Developed for use in science and social studies but contains numerous activities requiring and developing language arts skills. Some activities are suitable for vocational agriculture.

Stated Objectives: To help students (1) acquire knowledge about environmental concepts; (2) learn to observe, measure, collect data, classify, hypothesize, predict, make value judgments, communicate, and solve problems dealing with environmental issues; (3) develop an environmental ethic; (4) use acquired skills and concepts in taking thoughtful, positive action to protect and enhance the environment.

Program Description: A set of six modules dealing with environmental issues, energy use, forest/watershed management, hazardous substances, wetlands, and wildlife habitat. Each module contains: (1) teacher background material, including content objectives; (2) four or five activities; (3) suggested class projects which deal with a local community manifestation of the issue under study, and activities dealing with its resolution; (4) individual or small group research projects which examine specific elements of the issue in greater detail; (5) a poster dealing with the issue. Most activities provide students with concrete experiences (dramatizations, contrived experiences, or direct, purposeful experiences). The activities often take students out of doors. Equipment and materials used are of low cost and easily obtained.

Sponsor/Producer: National Wildlife Federation with the National Science Foundation.

Additional Comments: (1) The program is an excellent example of the kind of activities which contribute to the achievement of skill and participation objective categories. It is recommended for use with Project Learning Tree or Project WILD to enhance the achievement of these objectives. (2) *Conserving Soil* and *The CLASS Project* are very complementary programs and should be used together. (3) CLASS is an acronym for Conservation Learning Activities for Science and Social Studies. (4) *The CLASS Project* materials are not for sale. They are available free of charge by attending a workshop lasting five-six hours. (5) For further information on this program contact: *The CLASS Project*, Environmental Education, Department of Public Instruction, P.O. Box 7841, Madison, WI 53707.

Conserving Soil

Grade Levels Served: 6-9, but may be adapted for use in grades 10-12.

Subject Areas: Agriculture, Science and Social Studies.

Stated Objectives: To help students (1) understand fundamental concepts of soil science; (2) examine the social and economic impacts of soils; (3) recognize how human activity tends to degrade soils; (4) understand reasons for using methods of soil conservation; (5) understand and propose solutions for current soil issues.

Program Description: The program is organized under three unit headings: Soils: An Overview; Managing and Conserving Soils; and Critical Soil Issues for the Future. The first unit consists of two lessons. Soil Science is taught through five activities, and The Social Impact of Soils is taught through three activities. The second unit consists of two lessons. Soil Degradation is taught through four activities, and Soil Conservation is taught through six activities. The last unit consists of one lesson, six issues in Soil Conservation, taught through six activities. Each activity is printed on a duplicator master and is accompanied by activity objectives, a list of supplies, procedures to follow, and answers to the questions on the student sheets. Four color transparencies—The Soil Ecosystem, A Soil Profile, A Soils Map, and A Land Use Planning Map—accompany the activity masters. A 15-page Teacher's Guide discusses each of the activities, provides background information and suggests additional activities.

Sponsor/Producer: Originally produced by the U.S. Department of Agriculture, Soil Conservation Service. Currently published by the National Association of Conservation Districts.

Additional Comments: (1) The program is an excellent source of activities for teaching about soil. It is not a comprehensive study of soils but does provide a fundamental base from which a resourceful teacher can develop a more complete study. (2) This program and *The CLASS Project* are very complementary. Numerous activities in one of these programs support similar activities in the other program. it is recommended that the two programs be used together when planning curriculum for grades 6-12. (3) The *Conserving Soil* materials are no longer available through the Soil Conservation Service. They are available for purchase from the NACD Service Department, P.O. Box 855, League City, TX 77573-9989 at $8.50 per copy. (4) *Conserving Soil* is provided free of charge to participants in workshops dealing with *The CLASS Project*. (5) For further information on this program contact: Conserving Soil, Environmental Education, Department of Public Instruction, P.O. Box 7841, Madison, WI 53707.

Sample Infused Units

Geometry in the Environment

Process Steps	Existing Unit Characteristics	Added Environmental Elements
1. Select environmental topic to be infused.		Geometric forms in the environment
2. Identify subject area units targeted for infusion.	Grade 1: Mathematics. Unit: Geometry.	
3. Develop environmental objectives for the subject matter unit.	1. To learn to identify spheres, cylinders, cubes, and cones 2. To learn to identify triangles, circles, squares and rectangle; and give the number of sides and corners 3. To recognize when two figures appear to be the same shape or size	1. To learn to recognize geometric shapes in objects in both built and natural environments
4. Specify the environmental content to be added to the unit.	1. Spheres have curved surfaces, no points or edges and roll easily, cylinders have edges and curved surfaces and roll easily, cones have sharp points, edges, and curved surfaces and roll easily, and cubes have edges, corners, flat surfaces and will not roll. 2. The surfaces of the above solids are circles, squares or rectangles. 3. Triangles are three-sided figures. 4. Many of the objects we use have the above (approximate) shapes. 5. Geometric forms of the same kind always have the same number of corners and sides. 6. Geometric forms of the same kind may vary in size.	1. Many solid objects in both the built and natural environments have (approximate) geometric forms such as spheres (raindrops, stones, light globes), cylinders (tree trunks, utility poles), cubes (salt crystals, boxes), cones (conifers, road safety markers). 2. Many objects in both the natural and built environment have faces or cross-sections which approximate circles (tree trunk cross section, clock face), squares (postage stamps, sidewalk squares), rectangles (tree trunk silhouette, street signs), triangles (conifer cross section, yield signs).

Geometry in the Environment

Process Steps	Existing Unit Characteristics	Added Environmental Elements
5. Develop new instructional procedures if they are needed.	Procedures normally employed in teaching this math lesson include examining objects, tracing sides of three-dimensional objects, geo-boards, or dot paper.	1. Take a hike to a park, or a trip to the school forest, or to some other natural environment to look for two and three dimensional forms. 2. Walk down a city street and look for shapes in objects people have built, or in natural objects such as trees and flowers.
6. Identify new process skills to be developed.	Observing, comparing, counting	None
7. Identify new resources.	Textbook, spheres, cylinders, cubes, cones, objects with these shapes, geoguards or dot paper	None
8. Identify related activities and suggested new topics for investigation.	Those suggested by textbook and teacher experience	None

Wildlife As Symbols

Process Steps	Existing Unit Characteristics	Added Environmental Elements
1. Select environmental topic to be infused.		Project WILD Activity: Wildlife in National Symbols
2. Identify subject area units targeted for infusion.	Grade 5: *Western Hemisphere: Latin American and Canada.* Unit: Brazil and the Silver River Countries. Activity: The Flags of Brazil and the Silver River Countries	
3. Develop environmental objectives for the subject matter unit.	To understand that historically national flag designs were developed to project a particular message.	1. To identify wildlife used in national symbols 2. To hypothesize reasons why wildlife are used in national symbols
4. Specify the environmental content to be added to the unit.	Flags are symbols of national unity. Citizens of countries are proud of their flags and what they stand for. The elements of each nation's flag symbolize certain things.	Many national symbols include animals, sometimes currently endangered species.
5. Develop new instructional procedures if they are needed.	1. Discuss the elements of the U.S. flag – stars, stripes, field, colors – and what they stand for. 2. Read the text and study the flag designs portrayed therein.	1. Discuss flags and other national symbols. Develop hypotheses about their origin. What might be their origin? What do they represent? Strength? Natural resources? Cultural heritage? 2. Ask individuals or groups of students to select a country and research the origin of its symbols. Do they contain animals? Plants? Are they endangered? What values might they represent? 3. Determine whether or not the hypotheses advanced earlier were correct.

Wildlife as Symbols

Process Steps	Existing Unit Characteristics	Added Environmental Elements
6. Identify new process skills to be developed.	Library research	Analyzing, comparing similarities and differences, formulating and testing hypotheses, researching, synthesizing
7. Identify new resources.	Textbook, *World Almanac and Book of Facts* (flag code)	Encyclopedias, books on flags, books on individual countries
8. Identify related activities and suggested new topics for investigation.	Those, if any, raised by students	Encyclopedias, books on flags, books on individual countries. 1. Examine state or community symbols; for example, Wisconsin's bird – robin; Wisconsin's soil – Antigo silt loam. 2. What do state license plates tell about a state? 3. Examine trademarks, logos, product advertising schemes. 4. Examine or develop coats-of-arms. 5. Survey schools to determine what their animal mascots are. What do they symbolize?

Pesticides in the Environment

Process steps	Existing Unit Characteristics	Added Environmental Elements
1. Select environmental topic to be infused.		Pesticides in food chains. (Project WILD Activity: Deadly Links.)
2. Identify subject area units targeted for infusion.	Grade 10: *Biology*. Unit: The World of Living Things. Chapter topic: Interrelationships in the Environment.	
3. Develop environmental objectives for the subject matter unit.	1. To develop an understanding of nutritional relationships among organisms 2. To develop an understanding of other relationships between species of organisms 3. To develop an understanding of various biogeophysical relationships between organisms	To develop an understanding of how pesticides and other chemicals enter food chains and food webs.
4. Specify the environmental content to be added to the unit.	Conditions making life on earth possible; concepts such as: nutrition, producers, consumers, parasites, host, scavengers, saprophytes, decomposers, food chains, food webs, trophic levels, herbivores, carnivores, omnivores, predator, prey, competition, abiotic factors, adaptations, biotic community, population, carrying capacity, range, territory	Kinds of pesticides; nature of pesticides; why people use pesticides; how pesticides enter food chains; possible effects of pesticides on living organisms.
5. Develop new instructional procedures if they are needed.	1. Read the textbook. 2. Use AV materials dealing with various topics. 3. Perform laboratory and field activities which develop the concepts included in the unit.	Conduct the activity "Deadly Links" from Project WILD (Secondary).
6. Identify new process skills to be developed.	Comparing and contrasting, determining frequencies, constructing data tables, graphing.	Analyzing, classifying, comparing similarities and differences, describing, generalizing, synthesizing

Pesticides in the Environment

Process Steps	Existing Unit Characteristics	Added Environmental Elements
7. Identify new resources.	1. Textbook 2. AV materials, including charts 3. Aquaria and terraria with living organisms 4. Materials for laboratory and field activities	1. Pipe cleaners, white and colored 2. Paper bags
8. Identify related activities and suggested new topics for investigation.	Those, if any, raised by students	1. Why are chemical pesticides used? What are some of the consequences of their use? 2. What trade-offs are involved in decisions to use or not to use them? 3. What alternatives are there to the use of chemical pesticides? 4. What are some examples of relevant local, national or international examples of pesticide use issues? 5. What pesticides are used in this community? Plan and conduct a survey to find out. What are the possible negative consequences of their use? How might this information be shared with the others in this community?

Environmental Topics for Infusion into the Existing Curriculum

In section 6 general suggestions were made regarding topics for infusion into various subject areas. More specific examples are given in the table that follows.

This list is not exhaustive. There are of course many, many more topics that could be listed. Most of the suggestions are for infusion into units of study in science in grades 3-12 and social studies in grades 1-12. Much of the "content" of environmental education in grades K-2 is the "content" of science as recommended in *A Guide to Curriculum Planning in Science*, and infusion as described in this guide is not needed. To a degree, the same thing is true of science in grades 3-6, but some suggestions for these grades are provided here.

Environmental health topics permeate the entire health curriculum as recommended in *A Guide to Curriculum Planning in Health Education* and therefore this table includes no suggestions in this area.

Consult section 6 for suggestions regarding other curricular areas.

Environmental Topic to be Infused	Subject Area (grade level) (course title)	Unit or Topic into which Infusion will Occur
Earth, as a provider of air, food, water	Social Studies (1) (Family, school, neighborhood)	Satisfying family and individual needs
Energy: increasing use	Social Studies (1) (Family, school neighborhood)	Contrasting then and now
Farmland preservation	Social Studies (3) (Communities around the world)	Rural communities
Whaling	Science (3)	Water habitats: the ocean
Great Lakes water diversion	Social Studies (4) (Wisconsin and the region; culture and environment)	Living in Wisconsin: the Great Lakes
Endangered species	Science (4)	Animal and plant populations: survival and change
Energy: sources	Social Studies (5) (American heritage)	The Industrial Revolution
Energy: conservation in the home	Science (5)	Electricity and magnetism: using electricity

Environmental Topic to be Infused	Subject Area (grade level) (course title)	Unit or Topic into which Infusion will Occur
Rainforest destruction	Social Studies (6) (Cultural perspectives)	Brazil
Mineral deposition	Science (6)	How rocks are formed
Water quality: Aswandam	Social Studies (7) (Global connections)	Ways of life in the Eastern Hemisphere: Egypt
Barn owls: food chains	Science (7) (Life science)	Food chains, webs, and pyramids
Acid precipitation	Social Studies (7) (Global connections)	Western Europe today: Germany
Soils and U.S. history	Social Studies (8) (U.S. studies)	The westward movement
Groundwater contamination	Science (8) (Earth science)	The water cycle
Energy: fuel supplies	Science (9) (Physical science)	Efficiency; science, technology and society
People – environmental relationships	Social Studies (10) (World studies)	Eastern religions
Pesticides: Agent Orange	Social Studies (11) (U.S. studies)	The Sixties: Vietnam
PCBs and other organic chemicals	Science (11) (Chemistry)	Biochemistry; science, technology and society
Environmental protection	Social Studies (12) (Political science)	Independent agencies: Environmental Protection Agency
Noise	Science (12) (Physics)	Waves and their properties: sound

Major Threats to Environmental Quality in North America

A 1984 survey of environmental educators in the United States rank-ordered the major threats to environmental quality in North America. They are listed here for consideration as study topics for students and teachers in grades 6-12, when skills and participation are the two categories of objectives to be emphasized.

The results of the survey are presented here in seven groups, Group 1 being those issues considered to be most serious and Group 7 those of least importance (but not unimportant).

Group 1. Ground water and drinking water contamination, hazardous waste management.

Group 2. Population growth, urban sprawl, radioactive waste disposal, acid deposition, toxic air pollutants, toxic surface water pollutants, pesticides, loss of agricultural land due to salinization, desertification, urbanization, soil erosion, overexploitation of agriculture soils.

Group 3. Energy scarcity, damage to marine environments, war, crowding and other impacts of urbanization, depletion of ozone layer, chemicals in food chains, ocean fisheries depletion, loss of tropical forests, coastal area degradation, wetland loss, nuclear accidents, terrorism, solid waste disposal, noise, point source water pollution, nonpoint source water pollution, water scarcity.

Group 4. Critical materials scarcity, wilderness and wild or scenic rivers degradation, proliferation of biological organisms, bioengineering wastes and mistakes, ambient air pollutants, indoor air pollution, chemical fertilizers.

Group 5. Plant and animal species loss, weather modifications, floods, mutagens, CO_2 accumulation in atmosphere, failure of aging infrastructure, drought, pathogens from human waste.

Group 6. Chemical plant explosions, earthquakes, volcanoes, and other natural disasters, microwave radiation, electronic pollution (O_3 from office machines).

Group 7. Radioactive debris from space.